Guadalupe River Watershed Planning Study Engineer's Report

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SANTA CLARA VALLEY WATER DISTRICT

GUADALUPE RIVER WATERSHED PLANNING STUDY

ENGINEER'S REPORT

PROJECT NO. 3015

Engineer's Report Prepared by Flood Control Planning Division

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PREFACE

The Santa Clara valley once supported extensive riparian vegetation along the creeks in the Guadalupe River watershed. The banks of the streams, prone to overbank flooding, supported a diverse and biologically rich habitat. After development began in the valley, the overall extent and condition of riparian vegetation and habitat value of the creek environment has changed due to the alteration of the stream banks. The floodplain and high terraces of the river, once dominated by riparian habitat, have been converted to urban development. The several linear miles of riparian vegetation remaining are broken into a discontinuous and narrow riparian corridor. Activities associated with urban development such as leaking underground storage tanks, industrial spills, land alteration, urban runoff, and nonpoint source pollution threatened to degrade the water quality in the Guadalupe River watershed. Flooding is a major problem in the Guadalupe River watershed. Accounts of flooding from the Guadalupe River date back to 1777 when San Jose was established as a Spanish pueblo. More recent significant floods have occurred in 1955, 1958, 1980, 1982, 1983, 1986, and 1995.

This report presents the water resource related problems in the Guadalupe River watershed. Watersheds are the most logical area at which actions should be taken to restore and protect water resources as most natural events and economic activities affect the quality of water resources principally within watershed boundaries. There are various ongoing integrated water resources management programs, both by the Santa Clara Valley Water District (District) and by others, in the watershed that address water resource related problems.

A multi-objective capital improvement project on the Guadalupe River between Highway 101 to Interstate 880 and Interstate 280 to Blossom Hill Road is recommended. Based on the District's integrated water resource planning process, a variety of alternatives that would best satisfy all the objectives of the District were evaluated. Each alternative is assessed for its effectiveness in addressing problems and its impact on riparian vegetation, wetland, wildlife habitat, fishery, water supply, local drainage, aesthetic, and recreation. To ensure all concerns were addressed, the alternative was developed in close coordination with the City of San Jose, San Jose Water Company, Santa Clara County Transportation Agency, and citizens residing in or owning property in the floodplain of the river. The recommended project was chosen from among all alternatives because it would best protect the community from the 1 percent flood, improve water quality in the river, increase water supply potential, solve erosion problems, improve maintenance access, reduce sedimentation problems, provide continuous fish passage to upstream habitat and a continuous riparian corridor for wildlife, and increase recreational development potential which complement the park and trail master plan.

This report is prepared in accordance with the District Act which requires an Engineer's Report on projects to be funded by District revenues. It also complies with the California Environmental Quality Act (CEQA) which requires an Environmental Impact Report (EIR) for any project which may have significant impact. On the basis of the initial study on the capital improvement project, it has been found that the preferred capital improvement project may have significant effects on the environment and therefore, an EIR was prepared.

CHAPTER 1
SUMMARY

STUDY OVERVIEW

This Engineer's Report presents the existing water resource related problems, including water quality and flooding, in the Guadalupe River watershed. The report describes the various on-going integrated water resources management programs in the watershed that are addressing those problems. It also describes a preferred ongoing integrated water resources management capital improvement project on the Guadalupe River between Highway 101 to Interstate 880 and Interstate 280 to Blossom Hill Road. A wide variety of alternatives and their significant impacts are discussed in this report.

GOALS AND OBJECTIVES OF THE SANTA CLARA VALLEY WATER DISTRICT

It is the goal[1] of the District to provide a supply of water, adequate in both quantity and quality, needed to meet the desired quality of life in the community, to provide protection against flooding in a manner that maintains the desired quality of life in the community, and to coordinate all other community water related programs to achieve full water management.

These goals are met through a series of objectives that direct the activities of the District.

General Objectives

- Consider the desires of the community in all District programs and projects.
- Protect the environment and the economic well-being of the community in the formulation and execution of District programs and projects.
- Provide environmental impact mitigation measures, such as revegetating District projects, as appropriate.

Water Supply Objectives

- Optimize conservation of all water resources.
- Insure optimal primary usage of local water resources with adequate importation of supplemental supplies.
- Plan for alternative supplemental water supplies, where feasible, including reclamation of waste water.
- Preserve and protect the local watersheds and groundwater basin.
- Preserve and enhance water quality, both surface and underground.

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[1] Source: Santa Clara Valley Water District Flood Control Handbook

Flood Damage Reduction Objectives

- Provide flood protection by management of the natural floodplain or of a modified floodplain, using the more structural types of channelization only where other measures are impractical.
- Give priority to protection against flooding of developed areas, with the areas of greatest potential damage having the highest priorities.
- Encourage proper controls to prevent incompatible land uses in areas subject to flooding.
- Discourage future land use practices which will subject existing urban areas to additional flooding.
- Insure that flood control measures taken to assist an area shall not induce flooding upon any other area.
- Maintain District facilities to ensure they continue to provide the level of flood protection for which they were constructed, both to protect the public's investment and to comply with regulations of the federal flood insurance program.

GUADALUPE RIVER WATERSHED

The Guadalupe River is located in the District's Central Flood Control Zone. The upper watershed is located in the eastern Santa Cruz Mountains near the summit of Loma Prieta. The Guadalupe River begins at the confluence of Alamitos Creek and Guadalupe Creek and flows northerly through downtown San Jose to San Francisco Bay. Calero, Guadalupe, and Almaden Reservoirs are located on tributaries to the Guadalupe River. These reservoirs are built for water conservation purposes but also provide some incidental flood control benefit.

On its way to the San Francisco Bay, the Guadalupe River is joined by Ross, Canoas and Los Gatos Creeks. Lexington Reservoir and Lake Elsman are located upstream of Los Gatos Creek. The total drainage area of the Guadalupe River watershed is approximately 170 square miles and is the second largest watershed in the Santa Clara County after Coyote Creek.

Problem Definition

The major problems in the Guadalupe River watershed are the threat of water quality degradation in the streams and the lack of adequate capacity to safely convey the 1 percent design flow.

In recent years, activities related to development, such as agricultural activities, industrial spills, transportation activities, leaking underground storage tanks, urban runoff, illegal dumping and nonpoint source pollution, have threatened surface water and groundwater quality in the Guadalupe River watershed. Regulatory agencies have begun to regulate all discharges that enter creeks and flow into the bay.

The Guadalupe River has a long history of flooding. Potential flood damage to surrounding properties and the extreme channel maintenance requirement pose a major threat in the Guadalupe River watershed. Over $200 million in damages would occur and over 7,000 existing structures would be affected as a result of a 1 percent flood. Lesser floods can also cause significant damage and community disruption, as witnessed during the 1982, 1983, 1986, and most recently 1995 floods. Over the long-term, annual flood damages would be expected to average about $9.2 million.

Other significant problems in the watershed are intensive on-going maintenance operations, erosion problems, sedimentation problems, fish passage problem, and local drainage problems. In the last 10 years, the District has spent over $4 million on erosion and related repairs in the Guadalupe River watershed. Erosion repair is continuing in a piecemeal fashion.

INTEGRATED WATER RESOURCES MANAGEMENT PROGRAMS IN THE GUADALUPE RIVER WATERSHED

There are many integrated water resources management programs, both by the District and by others, that were created to address the various water resource related problems in the Guadalupe River watershed.

Being the county's wholesale water supplier, the managing agency of the area-wide Nonpoint Source Program (Program), and a co-permittee of the Program's National Pollutant Discharge Elimination System (NPDES) permit, the District has projects and programs to meet it's objective of water supply and water quality protection and restoration.

In 1975, the District completed a Water Supply Master Plan and EIR for the District's water utility. That document projected the need for supplemental water to meet the county's long-term water needs and identified the in-county distribution system facilities needed to maximize the use of the San Felipe Division water and other available water supplies while minimizing costs.

The San Felipe Division facilities have been constructed and began delivering water to Santa Clara County in June 1987. Concurrent with construction of the San Felipe Division and consistent with the 1975 Master Plan, the District's in-county distribution system was also expanded to best incorporate San Felipe Project waters into the District system (See Figure 1.1).

The District operates the reservoirs within the Guadalupe River watershed for water conservation. Winter runoff is conserved in the reservoirs and released in summer months for recharge to the groundwater basins. Locally conserved water is augmented with imported water for recharge. Some of the water quality protection and restoration programs are Adopt-A-Creek program, Santa Clara Valley Nonpoint Source Pollution Control Program, Groundwater Protection Program, Environmental Program, Comprehensive Reservoir Watershed Management Project, and Environmental Compliance Program. The District also has adopted policies and ordinances to regulate and protect the water resources in the Santa Clara County. Under District Ordinance 83-2, the pollution of the water supplies of the District, whether in streams, reservoirs or conduits of any kind, or groundwater, by any direct or indirect means whatever, is prohibited.

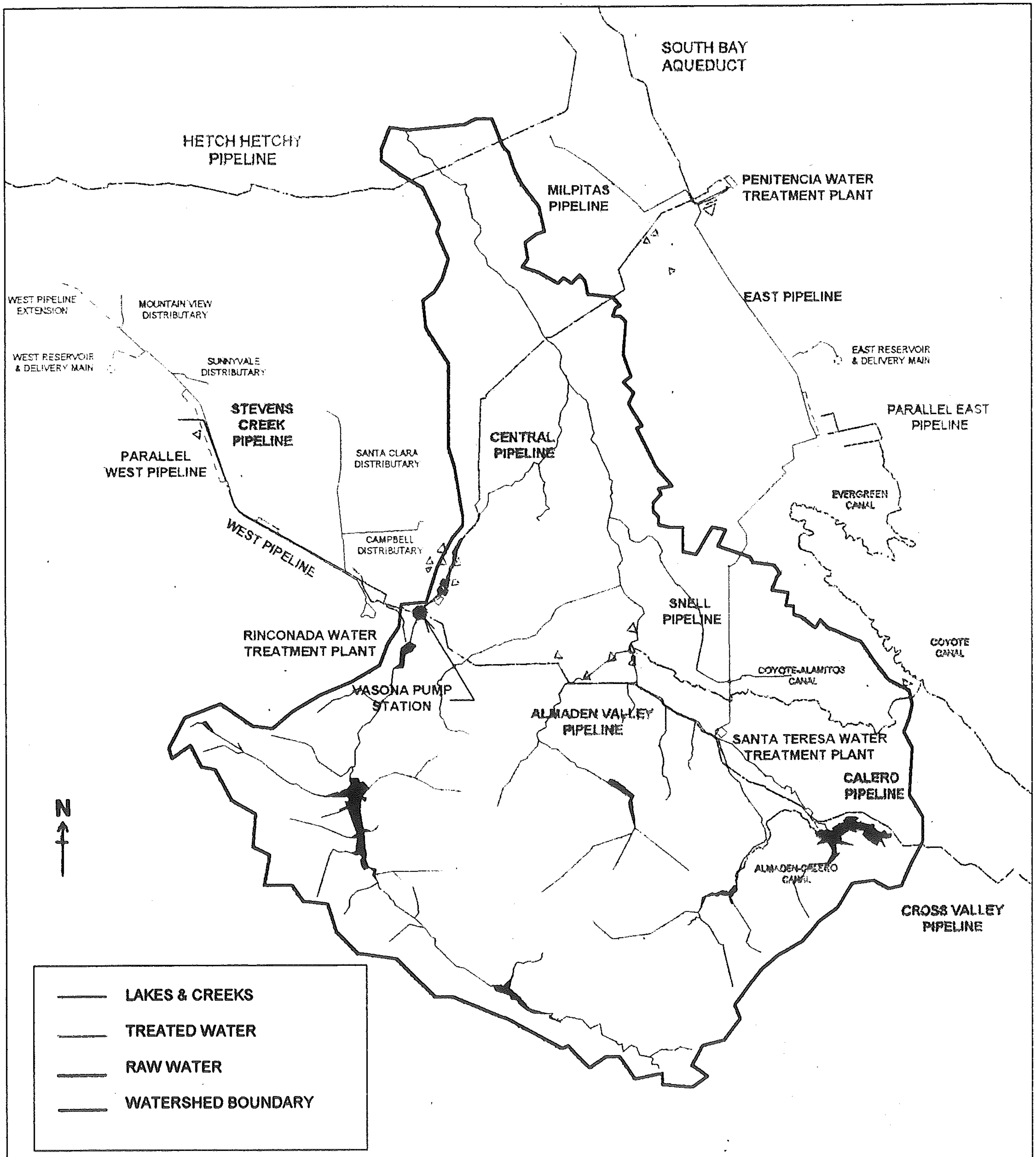

FIGURE 1.1 - WATER SUPPLY MASTER PLAN IN GUADALUPE RIVER WATERSHED

The San Jose City Council adopted the Horizon 2000 General Plan for the City of San Jose in 1984. The Plan seeks to balance natural resource conservation and urban development, so as to maximize the achievement of environmental, economic and social needs. Another goal of the Plan is to protect water resources wherever possible.

The Santa Clara County also adopted the County General Plan in 1990. This plan seeks to protect creeks and streamside areas. It restricts development in floodplains and requires public projects to preserve and avoid damages to the stream environment.

In addition, there are regulatory mandates that are applicable in the Guadalupe River watershed to protect the natural environment and water resources. They include permits required under Section 404 of the Clean Water Act, and a Streambed Alteration Agreement under Sections 1601 and 1603 of the California Fish and Game Code. Projects in the baylands require a Bay Conservation and Development Commission (BCDC) permit and all projects must comply with the Nonpoint Source Program's NPDES permit, new drinking water standards, Groundwater Management Plan regulations, and the requirements of the Regional Water Quality Control Board (RWQCB).

CAPITAL IMPROVEMENT PROJECT

A multi-objective capital improvement project in the Guadalupe River from Highway 101 to Interstate 880 and from Interstate 280 to Blossom Hill Road is recommended as part of this study. This project reach is at the upper half of the Guadalupe River watershed which includes Canoas and Ross Creeks (Figure 1.2). The improvement in the lower part of the watershed is included in the San Jose Downtown U.S. Army Corps of Engineer's (Corps) Project, which has been under construction since 1993. The proposed improvement in this reach is the last portion of the Guadalupe River that: lacks adequate capacity to safely convey the 100-year flood flow; lacks continuity for a future trail from Alamitos Creek to downtown San Jose; and contains fish barriers that hinder fish migration to upstream habitat.

In a multi-objective integrated water resource planning process, the District evaluates a variety of alternatives that would best satisfy all the objectives of the District and community on a watershed basis. Each alternative is assessed for its effectiveness in addressing problems and its impacts on riparian vegetation, wetland, wildlife habitat, fishery, water supply, local drainage, aesthetic, and recreation. This is facilitated through the use of a Project Planning Team which consists of District staff from various departments and areas of expertise. To ensure all concerns were addressed, the alternative was developed in close coordination with the City of San Jose, San Jose Water Company, Santa Clara County Transportation Agency, and citizens residing in or owning property in the floodplain of the river. The District would also seek to integrate other water resource management programs in the watershed into the preferred project.

Alternatives that have been evaluated during the planning process include "no project," nonstructural, upstream storage (reservoir construction and reservoir operation alterations), offstream storage, and channel modifications. Table 1.1 presents the summary of these alternatives. The channel modifications alternative was selected because it is practicable and achieves most of the District's goals and objectives. Other alternatives are considered infeasible and impracticable because of high costs, only partially solve the flooding problems, high social impacts of relocating families and removing homes, greater impacts to the aquatic and wildlife ecosystem, and major impacts to the water supply in the valley.

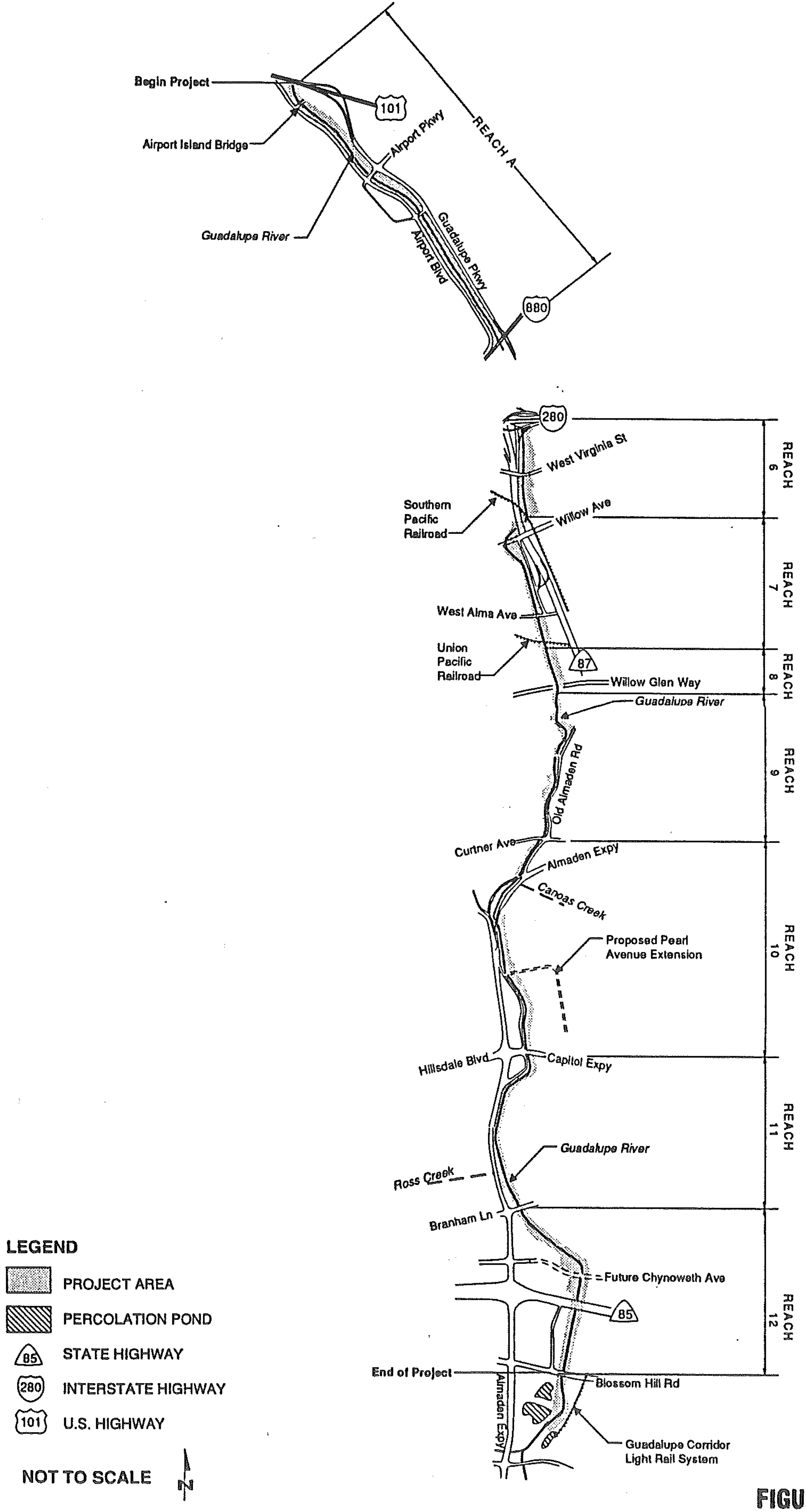

FIGURE 1.2: STUDY AREA

KLEINFELDER	LOCATION OF PROJECT ALIGNMENT GUADALUPE RIVER PROJECT SAN JOSE, CALIFORNIA	PLATE 1
DRAFTED BY: L. Sue DATE: 6-8-94		
CHECKED BY: C. Kennedy DATE: 1-19-94	PROJECT NUMBER 12-178000/803	

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CAD FILE: Macintosh, Canvas 3.5, Plate 1

TABLE 1.1
Guadalupe River—Summary of Conceptual Capital Improvement Alternatives

Problems, Concerns, and Impacts	Conceptual Alternatives						
	Existing Conditions	No Project	Nonstructural	Upstream Reservoirs Construction with Channel Modifications	Change Upstream Reservoirs Operation with Channel Modifications	Offstream Storage with Channel Modifications	Channel Modification
Description of Conceptual Alternatives	Major problems are threat to water quality and lack of adequate capacity to carry 1 percent design flow. Other significant problems are erosion, sedimentation, local drainage, degraded fish habitat, fish passage, and maintenance problems.	No measures taken to reduce current risk of flooding. Mandatory flood insurance required in floodprone areas. Ongoing erosion would be repaired on an emergency basis. Existing condition would remain if not worsened.	Flood damage to structures would be solved without channel modifications. 7,200 structures would be floodproofed. Regulate floodplain development does not apply because the floodplain is already well developed. Ongoing erosion would be repaired on an emergency basis. Existing condition would remain.	Construct new Guadalupe Dam and enlarge Almaden Dam to reduce peak flow rate downstream. Significant channel modifications would also be required in Reaches 6 to 10A. Mitigate the impacts on site and on adjacent lands.	Alter operation of three water supply reservoirs to flood control. Significant channel modifications would also be required in Reaches 6 to 10A. Mitigate the impacts on site and on adjacent lands.	Build diversion structure and offstream detention ponds to reduce peak flow rate in channel. Significant channel modifications would also be required in Reaches 6 to 10A. Mitigate the impacts on site and on adjacent lands.	Modify existing stream channel to contain the 1 percent flood and resist scour from high velocities. Mitigate the impacts on site and on adjacent lands.
Flooding Problems	High risk of flooding, continue mandatory flood insurance	Existing condition would remain. Expected annual flood damages of $9.2 million.	Flooding would still occur causing some damages, disruption of services and resulting in cleanup costs.	Reservoirs alone would not eliminate the threat of 1 percent flood and the mandatory flood insurance. Additional channel modification would provide 1 percent protection.	Change of reservoirs operation alone would not eliminate the threat of 1 percent flood and the mandatory flood insurance. Additional channel modifications would provide 1 percent protection.	Offstream ponds alone would not eliminate the threat of 1 percent flood and mandatory flood insurance. Additional channel modifications would provide 1 percent protection.	Eliminate the threat of 1 percent flood and mandatory flood insurance.
Maintenance Concerns	Poor maintenance access, required intense maintenance. Discontinuous right of way and easements.	Existing condition would remain.	Existing condition would remain.	Improve maintenance access, required less intense maintenance in Reaches 6 to 10A.	Improve maintenance access, required less intense maintenance in Reaches 6 to 10A, but more at reservoirs.	Improve maintenance access, required less intense maintenance in Reaches 6 to 10A.	Improve maintenance access, required less intense maintenance in Reaches A to 12.

TABLE 1.1
Guadalupe River—Summary of Conceptual Capital Improvement Alternatives
(continued)

Problems, Concerns, and Impacts	Conceptual Alternatives						
	Existing Conditions	**No Project**	**Nonstructural**	**Upstream Reservoirs Construction with Channel Modifications**	**Change Upstream Reservoirs Operation with Channel Modifications**	**Offstream Storage with Channel Modifications**	**Channel Modification**
Erosion Problems	Active erosion occurs due to steep and unstable banks.	Existing condition would remain if not worsened. Erosion repair on priority basis.	Existing condition would remain. Erosion repair on priority basis.	Repair areas of active erosion, decreases erosion potential in Reaches 6 to 10A.	Repair areas of active erosion, decreases erosion potential in Reaches 6 to 10A.	Repair areas of active erosion, decreases erosion potential in Reaches 6 to 10A.	Repair areas of active erosion, decreases erosion potential in Reaches A to 12.
Sedimentation Problems	Periodic removal of sediment in the channel bottom.	Existing condition would remain.	Existing condition would remain.	Requires less frequent sediment removal in Reaches 6 to 10A.	Requires less frequent sediment removal in Reaches 6 to 10A.	Requires less frequent sediment removal in Reaches 6 to 10A.	Requires less frequent sediment removal in Reaches A to 12.
Local Drainage Problems	Long duration and high frequency of flooding in the streets and local ponding.	Existing condition would remain.	Existing condition would remain.	The duration and frequency of flooding in the streets and local ponding would decrease slightly.	The duration and frequency of flooding in the streets and local ponding would decrease slightly.	The duration and frequency of flooding in the streets and local ponding would decrease slightly.	The duration and frequency of flooding in the streets and local ponding would decrease slightly.
Water Quality Problems	Water quality threatened.	Existing condition would remain if not worsen.	Existing condition would remain if not worsen.	Some improvement in water quality due to improved creek environment in Reaches 6 to 10A.	Some improvement in water quality due to improved creek environment in Reaches 6 to 10A.	Some improvement in water quality due to improved creek environment in Reaches 6 to 10A.	Improvement in water quality due to improved creek environment in Reaches 6 to 12.
Aesthetic Impacts	Degraded aesthetic qualities due to concrete rubble and sacked concrete used for erosion repair, illegal dumping, nonpoint source pollution.	Existing condition would remain if not worsen.	Existing condition would remain if not worsen.	Implement better environmental approach to erosion repair work, provide better maintenance access for cleanup and improve creek environment in Reaches 6 to 10A.	Implement better environmental approach to erosion repair work, provide better maintenance access for cleanup and improve creek environment in Reaches 6 to 10A.	Implement better environmental approach to erosion repair work, provide better maintenance access for cleanup and improve creek environment in Reaches 6 to 10A.	Implement better environmental approach to erosion repair work, provide better maintenance access for cleanup and improve creek environment in Reaches A to 12.

TABLE 1.1
Guadalupe River—Summary of Conceptual Capital Improvement Alternatives
(continued)

Problems, Concerns, and Impacts	Conceptual Alternatives						
	Existing Conditions	**No Project**	**Nonstructural**	**Upstream Reservoirs Construction with Channel Modifications**	**Change Upstream Reservoirs Operation with Channel Modifications**	**Offstream Storage with Channel Modifications**	**Channel Modification**
Wildlife Habitat Impacts	Moderate wildlife habitat.	Existing condition would remain if not worsen.	Existing condition would remain if not worsen.	Major impacts to wildlife habitat at reservoir sites and from channel modifications. Impacts mitigated partially on site and on adjacent lands would reestablish a continuous wildlife corridor along the stream in Reaches 6 to 10A.	Major impacts to wildlife habitat at reservoir sites and from channel modifications. Impacts mitigated partially on site and on adjacent lands would reestablish a continuous wildlife corridor along the stream in Reaches 6 to 10A.	Impacts mitigated on site and on adjacent lands would reestablish a continuous wildlife corridor along the stream in Reaches 6 to 10A.	Impacts mitigated on site and on adjacent lands would reestablish a continuous wildlife corridor along the stream in Reaches A to 12.
Riparian Vegetation Impacts	Degraded and discontinuous riparian corridor.	Existing condition would remain if not worsen.	Existing condition would remain if not worsen.	Major impacts to 1.6 creek miles and 167 acres of riparian vegetation at reservoir sites. Additional impacts to 2.7 creek miles from channel modifications. Impacts mitigated partially on site and on adjacent lands would reestablish a continuous riparian corridor along the stream in Reaches 6 to 10A.	Impacts mitigated on site and on adjacent lands would reestablish a continuous riparian corridor along the stream in Reaches 6 to 10A.	Impacts mitigated on site and on adjacent lands would reestablish a continuous riparian corridor along the stream in Reaches 6 to 10A.	Impacts mitigated on site and on adjacent lands would reestablish a continuous riparian corridor along the stream in Reaches A to 12.
Wetland Impacts	Moderate wetland habitat.	Existing condition would remain if not worsen.	Existing condition would remain if not worsen.	Major impacts to wetlands at reservoir sites and from channel modifications. Impacts can only be partially mitigated in Reaches 10 and 12.	Major impacts to wetlands at reservoir sites and from channel modifications. Impacts can only be partially mitigated in Reaches 10 and 12.	Mitigate by creating wetlands in Reaches 10 and 12.	Mitigate by creating wetlands in Reaches 10 and 12.

TABLE 1.1
Guadalupe River—Summary of Conceptual Capital Improvement Alternatives
(continued)

Problems, Concerns, and Impacts	Conceptual Alternatives						
	Existing Conditions	No Project	Nonstructural	Upstream Reservoirs Construction with Channel Modifications	Change Upstream Reservoirs Operation with Channel Modifications	Offstream Storage with Channel Modifications	Channel Modification
Fishery Impacts	Degraded fish habitat, existing fish barriers prevented fish from migrating upstream, limited low flow channel.	Existing condition would remain if not worsen.	Existing condition would remain if not worsen.	Major impacts to fish habitat at reservoir sites and from channel modifications. Impacts mitigated partially on site and on adjacent lands would reestablish a continuous low flow channel in Reaches 6 to 10A.	Major impacts to fish habitat at reservoir sites and from channel modifications. Loss of water releases from reservoirs in summer months. Impacts mitigated partially on site and on adjacent lands would reestablish a continuous low flow channel in Reaches 6 to 10A.	Impacts mitigated on site and on adjacent lands would reestablish a continuous low flow channel in Reaches 6 to 10A.	Impacts mitigated on site and on adjacent lands would reestablish a continuous low flow channel in Reaches A to 12, and remove all fish barriers and provide fish passage to upstream habitat.
Water Supply Impacts	Almaden,Calero, and Guadalupe Reservoirs yield 13,900 AF/year for local water supply.	Existing condition would remain.	Existing condition would remain.	Increase storage capacity in the summer months at reservoirs. Potential for additional water supply yield.	Loss of 13,900 acre-foot/year because reservoirs would be kept empty during the winter months at the cost of $5 million/year. Supplemental water may not be readily available for purchase. There may be regulatory constraints in the federal or state systems that impact the ability to import water to the county.	Increase groundwater recharge potential in the summer months at the off-stream ponds.	Small increase groundwater recharge potential at Reach 12.

TABLE 1.1
Guadalupe River—Summary of Conceptual Capital Improvement Alternatives
(continued)

Problems, Concerns, and Impacts	Conceptual Alternatives						
	Existing Conditions	**No Project**	**Nonstructural**	**Upstream Reservoirs Construction with Channel Modifications**	**Change Upstream Reservoirs Operation with Channel Modifications**	**Offstream Storage with Channel Modifications**	**Channel Modification**
Recreation Impacts	No access to the river corridor, no recreation potential.	Existing condition would remain.	Existing condition would remain.	Increase recreation area at reservoirs during the summer months. Maintenance access and roads are designed to allow for future trail development in Reaches 6 to 10A.	Increase recreation area at reservoirs during the summer months. Maintenance access and roads are designed to allow for future trail development in Reaches 6 to 10A.	Increase recreation area around the ponds. Maintenance access and roads are designed to allow for future trail development in Reaches 6 to 10A.	Maintenance access and roads are designed to allow for future trail development connecting Los Alamitos to downtown San Jose.
Cost as 1995 Present Worth		$200 million in flood damages	$600 million	$173 million	$120 million	$600 million	$122.2 million
Equivalent Annual Capital Cost		$9.2 million	$49.5 million	$14.3 million	$9.9 million	$53.3 million	$10.1 million
Time to Complete Project				50 years	40 years		25 years
SUMMARY		Not selected because it does not solve the significant flooding, erosion, water quality, and creek degradation problems.	Not selected due to high cost. Residual damages from flooding continued. It does not solve the significant water quality, and creek environmental degradation problems.	Not selected because of substantial impact to the riparian ecosystem and the high cost of construction.	Not selected because of substantial adverse impact on availability of water and the uncertainty of relying on additional imported water due to increasingly stringent protection measures for the environment in the Delta.	Not selected because of high cost.	Selected because it achieves most of the District's goals and objectives.

During the course of the evaluation, public input was sought through a series of meetings. Three public meetings were held in March 1989. Feasible alternatives and a selected plan were discussed. The 260 people that attended the meetings were generally supportive of the project. There were also follow up field meetings with the residents to discuss their concerns.

In April 1990, a special meeting to discuss relocation issues was held with all owners and tenants whose properties may be acquired by the project. In December 1991, three public map review sessions were held to present the revised preferred project.

In May 1995 three public meetings were held, where the preferred project was presented. The 100 people who attended the meetings were generally supportive of the project, and many would prefer to have a shorter construction schedule.

There were also meetings held with the District's environmental consultants, the California State Department of Fish and Game (CDFG), and the U.S. Fish and Wildlife Services to develop a refined plan that will further reduces the impacts of the project and mitigates the unavoidable impacts. In October 1992, the District staff met with the City of San Jose Public Works, Transportation, and Park staffs to discuss the preferred project.

An extensive survey of streams within the Guadalupe River watershed was performed. It included, identifying fish barriers, riparian vegetation mapping, assessment of historic sedimentation problems, identifying specific erosion sites, flood mapping, heavy metals analysis, identifying fuel leak and hazardous material sites, storm water outfalls inventory, existing and future land use inventory, identifying water supply opportunities, and parks and trails master plan assessment. A study on the local and regional hydrological, geological, ecological, land use, transportation circulation, recreational, historical, and cultural issues affecting the river corridor was also conducted.

The preferred capital improvement project would improve water quality and provide 1 percent flood capacity in the Guadalupe River. The project would remove all eight barriers that prevent fish from migrating upstream and restore access to 19 miles of stream habitat. Revegetation features in the project would reestablish a continuous riparian corridor along the stream and improve the riparian system in the Guadalupe River watershed with an additional 6,600 linear feet of overwater vegetation and 9 acres of riparian forest. Sediment and turbidity in the water contributed from erosion of banks would be reduced as the project would decrease the frequency of erosion on banks. Maintenance and public access to the natural resource would be made available. Future implementation of the park and trail master plan for 6 miles from Alamitos Creek to downtown San Jose would be feasible.

The construction of this project and this project's integration with other projects and programs in the Guadalupe River watershed, could help prevent the ongoing physical degradations of the natural stream, water quality, wetlands, riparian habitat, and fish habitat in the Guadalupe River watershed.

A summary of the preferred capital improvement project for channel modification is presented in Table 1.2.

The total project cost is estimated to be $120.4 million of which $45.7 million is for right of way acquisition, $73.8 million is construction related, and approximately $2.7 million is for mitigation. An estimate of reach by reach costs are summarized in Table 1.3.

TABLE 1.2
Guadalupe River—Summary of Proposed Capital Improvement Project

Reach	Limits	Proposed Measures	Total Cost (millions)
A	Bayshore to I-880	Levees, floodwalls, and maintenance roads	$1.3
6	I-280 to SPRR	Gabion bypass channel	$19.0
7	SPRR to UPRR	Gabion bypass channel	$27.0
8	UPRR to Willow Glen Way	Gabion bypass channel	$10.3
9	Willow Glen Way to Curtner Avenue	Selective widening and cribwall lining	$14.3
10	Curtner Avenue to Capitol Expressway	Bank widening, levee and widened gabion channel with revegetation	$15.9
11	Capitol Expressway to Branham Lane	Widened gabion channel	$10.8
12	Branham Lane to Blossom Hill Road	Levee and revegetation area	$15.6
Canoas Creek	Guadalupe River to end of Nightingale Drive	Floodwalls	$1.5
Ross Creek	Guadalupe River to Jarvis Avenue	Widened channel with articulated mat lining and culverts	$2.0
Guadalupe River, Alamitos Creek, and Guadalupe Creek		Fish barrier modifications	$0.3
		TOTAL	$120.4

TABLE 1.3
Guadalupe River—I-101 to I-880; I-280 to Blossom Hill Road Capital Improvement Project Cost and Schedule Summary

Reach	Scheduled Construction[1]	Right of Way ($ Mil)	Mitigation ($ Mil)	Construction ($ Mil)	Total ($ Mil)
A	1998-1999	0.0	0.0	1.3	1.3
6	1998-1999	11.3	0.2	7.5	19.0
7	1999-2001	7.6	0.2	19.2	27.0
8	2002-2003	5.3	0.0	5.0	10.3
9	2008-2010	3.9	0.2	10.2	14.3
10	2010-2017[2]	3.8	1.2	10.9	15.9
11	2021-2023[2]	3.0	0.3	7.5	10.8
12	1998-1999	10.8	0.6	4.2	15.6
Canoas Creek	2022-2023	0.0	0.0	1.5	1.5
Ross Creek	2017-2018	0.0	0.0	2.0	2.0
Fish Barrier Modifications[2] Upstream of Blossom Hill Road	1998-1999	0.0	0.0	0.3	0.3
PROJECT TOTAL		45.7	2.7	72.0	120.4

[1] Assumptions: (1) no federal funding; (2) benefit assessment continues at current rate beyond year 2000

[2] Including fish barrier removal. Interim fish barrier remediation may be provided.

The project would be funded by existing revenues generated in the Central Flood Control Zone. These sources include the District's allocation of the 1 percent property tax and flood control benefit assessments.

The project would be constructed over a 25-year period commencing in the 1997-1998 construction season. It is proposed that the construction start in Reach 6 and proceed upstream. This schedule would provide maximum amount of flood protection as soon as possible without inducing flooding downstream. It is also proposed that the construction and installation of vegetation in Reach 12 be undertaken in approximately the same construction season as Reach 6 to provide compensation for temporal loss of habitat. The proposed schedule for the project is presented in Table 1.3. The schedule assumes continuation of benefit assessment revenues at the current rate beyond the year 2000. Without these revenues the completion of all the proposed facilities could be delayed up to 20 years. Also, if another more costly alternative is constructed, for every $10 million increase in the project cost, there will be a 5-year delay in solving other flooding problems within the Central Zone. A 5-year delay exposes residents of the floodplain to 5 more years of the possibility of incurring flood damages.

CHAPTER 2
THE GUADALUPE RIVER WATERSHED

This chapter of the report discusses the Guadalupe River watershed and describes the ongoing integrated water resources management programs, and the various problems in the watershed.

THE WATERSHED

The Guadalupe River is located in the District's Central Flood Control Zone. The headwaters originate high in the eastern Santa Cruz Mountains from the summit of Loma Prieta, elevation 3,790 feet. The watershed is depicted in Figure 2.1.

The Guadalupe River begins at the confluence of Alamitos Creek and Guadalupe Creek. There are three reservoirs located on upstream tributaries to the Guadalupe River. The largest of these is Calero Reservoir with a storage capacity of 10,050 acre-feet at spillway elevation. Guadalupe Reservoir and Almaden Reservoir have capacities of 3,740 and 1,780 acre-feet respectively. The location of the reservoirs is shown in Figure 2.1.

All three of these reservoirs were designed and constructed for water conservation purposes but also provide incidental flood control benefits. The incidental flood control benefit provided by each reservoir is generally related to the storage capacity of the reservoir and the size of the drainage area upstream of the reservoir. The upstream drainage areas for Calero, Guadalupe, and Almaden Reservoirs are about 7, 6, and 12 square miles respectively.

As it flows toward San Francisco Bay, three tributary creeks join the river. Ross Creek drains an area of about 10 square miles before it joins the Guadalupe River just downstream of Branham Lane. Canoas Creek drains an area of about 19 square miles and then flows into the Guadalupe River just upstream of Curtner Avenue. As the Guadalupe River flows through downtown San Jose, it is joined by Los Gatos Creek.

Los Gatos Creek has a drainage area of about 55 square miles above its confluence with the Guadalupe River. Lexington Reservoir is located upstream on Los Gatos Creek and has a storage capacity of 20,250 acre-feet. The drainage area above Lexington Reservoir is 37.5 square miles.

The Guadalupe River continues to flow north along the east side of the San Jose Airport. Near Highway 237, the Guadalupe River has a total drainage area of about 170 square miles. Further north, the river enters the Baylands area and the community of Alviso. In this reach, the Guadalupe River is subject to daily tidal influence.

INTEGRATED WATER RESOURCES MANAGEMENT IN THE GUADALUPE RIVER WATERSHED

There are various ongoing integrated water resources management programs, both by the District and by others, in the Guadalupe River watershed.

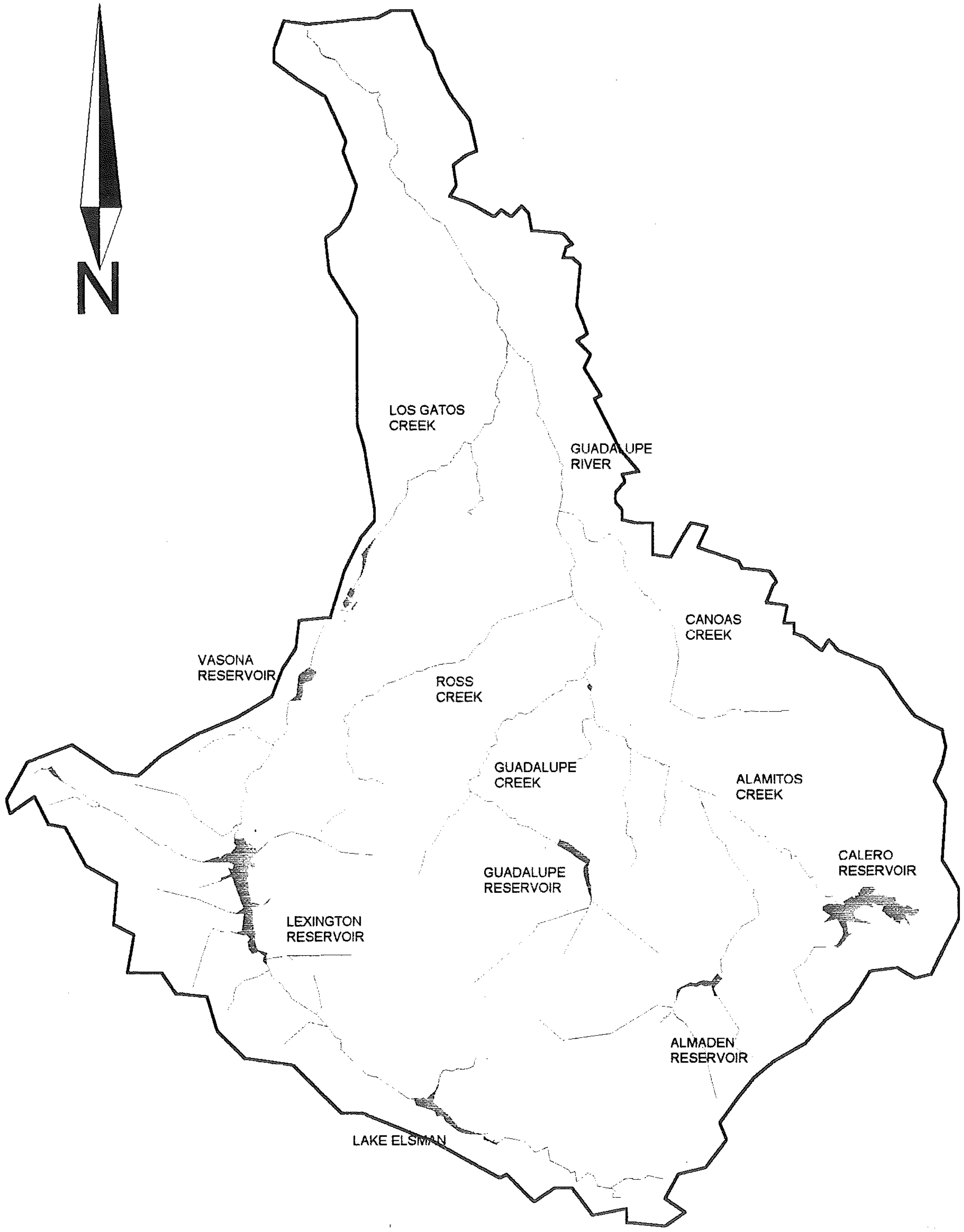


FIGURE 2.1 - THE GUADALUPE RIVER WATERSHED

District

The District has different integrated water resources management programs that would improve the water quality of south San Francisco Bay and the streams of the Santa Clara County, which includes Guadalupe River watershed. Some of those programs are:

- Flood Damage Reduction Program
- Adopt-A-Creek Program
- Santa Clara Valley Nonpoint Source Pollution Control Program
- Groundwater Protection Programs
- Environmental Programs
- Comprehensive Reservoir Watershed Management Program
- Environmental Compliance Programs
- Design Coordination Programs
- Water Supply Programs

Flood Damage Reduction Program

The District has a flood control program that systematically addresses flooding, erosion, sediment, maintenance and water quality issues in a multi-objective planning process. The District flood control projects undergo extensive planning and design before construction begins. Impacts of the projects on flows, fish and wildlife, vegetation, water quality, water supply, and homes and businesses within the watershed are all taken into account during the planning process. Public concerns are evaluated in a lengthy review process. The District also seeks to integrate other projects and programs in the watershed into the flood control projects.

The current schedule for implementation of projects in the Guadalupe River Watershed is:

Guadalupe River - Highway 101 to Interstate 880 and Highway 280 to Blossom Hill Road	1997
Canoas Creek - Guadalupe River to Nightingale Drive	2025
Ross Creek - Guadalupe River to Jarvis Avenue	2020
Ross Creek - Jarvis Avenue to Camino Del Cerro	2026
Los Gatos Creek - Guadalupe River to Highway 280	2028
Los Gatos Creek - Kirk Dam to Vasona Reservoir	2031
Randol Creek - Alamitos Creek to Bret Harte	2032
Los Gatos Creek - Meridian Avenue to Campbell Avenue	2034

The schedule assumes benefit assessment revenues continue at the present rate beyond the year 2000. Delays would occur if funding is reduced or there is an increase in project cost.

Adopt-A-Creek Program

The District has a program that is similar to Caltrans' Adopt-A-Highway program. With the Adopt-A-Creek, the District will issue permits to program partners who adopt a section of creek to clean where the District has fee ownership. The program provides an opportunity for citizens to participate in cleaning the creeks and improving the water quality in the Santa Clara valley. In the Guadalupe River watershed, several sections of creeks have been adopted. Some of them are: Los Gatos Creek from Bascom Avenue to Leigh Avenue and Campbell Avenue to Vasona Dam, Canoas Creek from Branham Lane to Edelweiss Drive and Blossom Hill Road to Calero Avenue, Guadalupe River from Almaden Expressway to Blossom Hill Road, Alamitos Creek from Coleman Avenue to McKean Road and Harry Road to Almaden Expressway, and Guadalupe Creek from Almaden Expressway to Meridian Avenue.

Santa Clara Valley Nonpoint Source Pollution Control Program

This Program is a multijurisdictional effort between the District, the Santa Clara Valley's 13 cities, and the County. The Program was established in response to two water quality regulations effecting the San Francisco Bay: the Federal Clean Water Act and the San Francisco Bay Basin Water Quality Control Plan.

The Program's long term goals can be grouped into two categories: (1) long term goals which are directly related to regulatory requirements, and (2) long term goals which are designed to protect resources and beneficial uses and are less directly related to regulatory requirements.

Long term goals which address regulatory requirements:

- Reduce Heavy Metal Loadings and Toxicity in Santa Clara Valley Streams and the South Bay.
- Reduce Heavy Metal Loadings and Toxicity in Sediments.
- Develop Cost-Effective Solutions to Storm Water Pollution Problems.
- Engage the Community in the Protection of Aquatic Resources.

Long term goals to protect resources and beneficial uses:

- Protect Santa Clara Valley Watersheds and South Bay.
- Protect Drinking Water Sources of Supplies.
- Protect Aquatic and Natural Resources.
- Engage the Community in Protecting Santa Clara Valley Watersheds.

To comply with the various provisions of the Program's NPDES storm water permit and to address other Program's goals, the Program implements the following control measures:

- Public Information: The Public Information/Participation Program (PI/P) is designed to eliminate and control storm water pollution through educational means. The PI/P

Element supports the Nonpoint Source Program by providing the mechanism by which information is conveyed to the various target audiences. These audiences generally include: residents, industry and commercial establishments, environmental and other interest groups, educational institutions, public agencies, and local governmental decision makers.

- Watershed Management Measures: The goal of Watershed Management Measures (WMM) is to facilitate the cost effective protection of the beneficial uses of Santa Clara Valley streams and the South bay. Secondary goals include: (1) specifically protecting surface and groundwater drinking water supplies through coordination with District projects and activities, (2) increasing community awareness and appreciation of the importance of watersheds and water resources, including creeks and the Bay, (3) engaging the community in watershed protection. WMM are a Program-wide activity which embraces other Program elements such as (1) New Development and Construction, (2) Public Information and Participation, and (3) Program Management.

  The WMM activities also meet the requirements and the spirit of the San Francisco Estuary Project's Comprehensive Conservation and Management Plan, the Coastal Zone Act and Reauthorization Amendments (CZARA), and the Regional Board's staff guidance on New Development Controls.

- Monitoring Program: The overall goal of monitoring is to obtain adequate information to characterize and define problems, and in turn implement and assess the effectiveness of management measures which are designed to provide reasonable protection of resources and beneficial uses. Key objectives of Program monitoring include comparing of storm water discharges with water quality objectives, identifying sources of pollutants and toxicity, evaluating effectiveness of control measures, and providing direction to the overall Program based upon an ongoing definition and characterization of problems.

- Metal Control Measures: The goal of the Program's Metals Control Measures (MET) is to reduce metals concentrations in Santa Clara Valley streams and loads to the South Bay for metals of environmental concern which substantially originate from urban sources or activities. MET activities generally fall into other Program elements such as Public Agency Activities or Industrial and Commercial Controls.

- Public Agency Activities: Control Measures under the Public Agency Activities (PAA) element have the goal of reducing or eliminating adverse water quality impacts due to construction, operation, and maintenance actions by municipalities of the Program. Successful implementation of PAA activities is particularly important since agencies in the Program should serve as good examples to the community.

- Illicit Connection and Illegal Dumping Identification and Elimination (ICID): Control measures under the ICID element have the goal of identifying and eliminating non-permissible non-storm water discharges associated with either illegal dumping or illicit connections between sanitary/process water lines and storm drains.

- Industrial and Commercial Discharges Control (IND): Control measures under the IND element are to control storm water discharges associated with industrial and commercial activities into municipal storm drain systems.

- New Development and Construction Activities: The goal of new development and construction activities control measures is to minimize the adverse effects on urban runoff from new and redevelopment both during and after construction. Activities contained within this element apply to private development and to public agency construction projects.

Groundwater Protection Programs

The District, along with the State RWQCB, takes a leading rôle in prevention and cleanup of leaking underground tanks, industrial spills, and other groundwater contaminants through a variety of ongoing programs.

- Fuel Leaks Cleanup: The District has been involved in overseeing the investigation and cleanup of fuel leak sites in the Santa Clara County since 1987.

- Solvent Leaks Cleanup: The District works closely with the RWQCB and other state and federal agencies to investigate and cleanup solvent leak sites. Throughout the years, solvent leaks have been impacting a few municipal water supply wells, resulting in closure and treatment of the water supply.

- Wellhead Standards and Protection: Since 1984, the District has been working to identify and seal wells that may pose contamination problems. Abandoned or improperly constructed wells may act as pathways for contaminants to migrate into deeper aquifers which supply drinking water. From time to time, the District conducts public education and enforcement efforts to ensure proper well construction and destruction practices.

- Storm Water Infiltration Device (SWID) Control: SWID are shallow storm water drainage wells (dry wells) that catch surface drainage water and percolate it into the ground. If constructed incorrectly, these wells can contribute to groundwater contamination. In August 1993, the District Board of Directors adopted a SWID Policy. This policy provides for a program to permit and register new and existing SWID's, as well as evaluate risk and regulate destruction of those found to be harming or at the greatest risk of harming groundwater. The policy regulates devices deeper than 10 feet in the ground which are at most risk for polluting groundwater, including dry wells, unlined drainage sumps, and detention ponds. Pursuant to the policy, new devices are subject to siting requirements and construction standards and are not allowed in high-risk areas such as industrial sites.

Environmental Programs

District staff prepare environmental documents, evaluate natural resources, and develop and implement mitigation programs. Great emphasis is focused on environmental protection, including the reestablishment and maintenance of streamside habitats. Some of the programs include:

- Vegetation Management Program: This program addresses all the measures and procedures used by maintenance crews to remove or control vegetation on District right of way. These measures consist of the application of herbicides and other chemical control agents, mechanical removal, hand labor removal and agricultural methods. An EIR is being prepared to assess the short-term, long-term, and cumulative impacts of this program on wildlife and fish habitat, surface water and groundwater quality, evaluate alternate means of accomplishing the goals of the program, and recommend mitigation to compensate for any adverse impacts.

- Erosion Control and Sediment Removal Routine Maintenance Program: This program addresses all measures and procedures used by the Maintenance Department to perform erosion control by various structural means and both instream and off-stream sediment removal. The purpose of this program is to develop a comprehensive approach to managing routine maintenance activities on District facilities. An EIR and related Corps permit applications are being prepared to comply with Section 404 of the Clean Water Act. The EIR and permit applications will: assess the short-term, long-term, and cumulative impacts of this program on wildlife and fish habitat; assess surface water and groundwater quality impacts; evaluate a broad range of alternatives in an equal level of detail; reduce the level of maintenance on any stream, up to a point where the stream can be self-maintaining; and define a formula for compensatory mitigation for impacts, a formula which identifies when on-site mitigation is appropriate, and when off-site mitigation within the watershed is appropriate.

- Stream Database Program: This program is a comprehensive and cost-effective biological survey of streams within the Guadalupe River watershed, evaluating the physical, biological and adjacent land use elements. This program will provide an advance planning tool with site-specific habitat descriptions and general evaluation of stream resources to assist in the early stages of flood control project planning and assessment. This information would serve as an early warning system by enabling staff to select alternatives that avoid major impacts to natural resources that could jeopardize the success of a project. This program will identify potential revegetation sites as part of District's project planning needs or as advance mitigation of impacts. It will also provide guidance to other cooperating agencies or organizations requiring project-related mitigation or restoration sites for jointly sponsored and mutually beneficial projects.

- Multipurpose Constructed Wetlands Project: This is a potential cooperative project between the District, the Nonpoint Source Pollution Program, and the City of San Jose. This project would address flood control mitigation, spill mitigation and potential future regional wetlands mitigation banking program. The findings of this project will also provide information for the Nonpoint Source Pollution Control Program on storm water treatment demonstration project and also provide information to the City wastewater treatment plant on effluent discharge reduction to the Bay during the dry season.

- Summer Dams Fisheries Study: This project is to monitor and study the impacts of construction and operation of in-stream seasonal spreader dams on anadromous fish. Seasonal dams located in Coyote Creeks, Guadalupe River, Los Gatos Creek, Saratoga Creek, Upper Penitencia Creek, and Stevens Creek are included in the study.

- Community Creekwatch (Streamkeeper) Program: This program is a community education and involvement program to train volunteers to conduct systematic resource inventories of the creeks within Santa Clara County. These inventories will identify critical creek areas for preservation, protection, and restoration. In addition, this program will enhance the public awareness of the creeks within the county, increase public participation in identifying creek pollution sources, and develop data for the environmental assessment of creeks. This program is funded by the District and administered by the Coyote Creek Riparian Station.

- Automated Environmental Mapping Program: This program involves the development of a computerized map system to locate and track areas of environmental concern in the creeks in Santa Clara County. The program includes the mapping of critical habitat areas, wetlands, sensitive species areas, and stream inventory data. This program will take data generated from the Streamkeeper Program (previously described) and place it into a computerized geographic information system. The program will provide geographic mapping which delineates areas of pollution and critical habitat that will aid in developing baseline data on watershed characteristics. In addition, the mapping information will be available for graphical presentations for use in public awareness programs. This program is funded by the District and administered by the Coyote Creek Riparian Station.

Comprehensive Reservoir Watershed Management Program

The goal of this program is to develop a District policy and program to protect the drinking water quality and supply of nine of the District's reservoirs. The impetus for this project is driven by:

- Increasingly stringent drinking water regulations that emphasize source water protection, e.g., with this project, the District supports the Safe Drinking Water Act and the Clean Water Act in protecting water quality.

- Increasing unreliability of imported water, e.g., the environmental issues in the Delta put the quantity of imported Delta water the District receives in jeopardy.

- The increasing demand for more recreational facilities and development in this county may place additional stress on reservoir operational flexibility and may have the potential to affect reservoir water quality.

This project will ensure that operational flexibility and water quality are preserved while ensuring and balancing community interests and needs. The project will develop a plan and methods to implement the plan, to be supported by the District's Board of Directors and the County Board of Supervisors. The project focuses on the watershed lands above the reservoirs. Since the District owns so little land in these watersheds, the Santa Clara County is the land-use agency responsible for land use control, a partnership between the county and the District is essential in order to achieve a reasonable level of protection of the county's water supplies.

Reservoir watershed management will provide an additional barrier of protection to the public water supply. It will also be more effective to prevent impacts to the reservoir than eliminate them once they have occurred. By this project, the District hopes to prevent negative impacts from occurring to the reservoirs when land use changes, development and activities occur.

Environmental Compliance Programs

The District's Environmental Compliance Division manages hazardous waste and ensures that the District complies with local, state, and federal hazardous material regulations. The division also conducts hazardous materials preacquisition investigations and remediates hazardous materials problems for District's capital improvement projects. Great emphasis is focused on response to hazardous material spills and illegal dumping. This protects the public and the environment, including fish, wildlife, and streamside habitats. Some of the programs this division manages are:

- Alignment Investigations Program: This program identifies potentially contaminated sites within a project area and delineates the extent of hazardous material contamination in the project alignment. All remedial activities will also be performed to minimize the impacts of, and the District's liabilities due to, hazardous material on District capital improvement projects.
- Property Acquisition Program: This program investigates and evaluates the impacts of hazardous materials on properties which will be acquired by the District in fee or easement.
- Emergency Response Program: This program is developed to protect the public, surface water, groundwater, and fish and wildlife from hazardous material spills or illegal disposal of hazardous material on District property, easement or right of way.
- Facility Compliance Program: This program ensures that the District facilities and the District's hazardous materials management comply with all local, state, and federal hazardous material regulations.
- Well Ordinance Program: This program ensures that the construction, maintenance, and destruction of wells in the County complies with the District's Ordinance and state regulations through a system of permitting and inspection.

Design Coordination Programs

The District has adopted policies and ordinances to regulate and protect the water resources in the Santa Clara County (County). Ordinance 83-2 applies to all water resources in the County and prohibits the pollution of the water supplies of the District, whether in surface streams, reservoirs, other conduits of any kind, or groundwater. This ordinance requires a District permit for the installation of any outfall discharging into a watercourse under District jurisdiction, revegetation, and any construction or soil disturbances within 50 feet of any creek bank. The objective of Ordinance 83-2 is to allow the District to properly manage streams to prevent or minimize erosion, preserve water quality, contribute to survival of the area's fish and wildlife, and help avoid flood losses. The life of a stream reflects conditions throughout its watershed, and not just those along its banks. The District's Design Coordination Division reviews plans and issues a permit only after investigating that the proposed work will not impact the District's facilities. Violation of the provisions of the ordinance and any failure to satisfy the terms of the permit are punishable as a misdemeanor.

Some of the programs with which the Design Coordination Division is actively involved in are:

- Ordinance 83-2 Violations Program: This program identifies violations of Ordinance 83-2 throughout the County and requires the violator to correct the condition within a specified time. Examples of common violations are: encroachment, illegal outfall, dumping, and erosion. In the Guadalupe River watershed, approximately 56 violations were reported and acted upon by the District in 1993. A summary of these violations is tabulated in Table 2.1. A copy of the ordinance is included in the report in Appendix M.

- Stream Care Brochure: The brochure promotes public awareness and encourages active participation from every resident in the County. This brochure addresses the preservation and enhancement of the streamside environment, protection of streams, and effective watershed management. The brochure targets streamside property owners to help reduce the number of Ordinance 83-2 violations.

Water Supply Programs

As a water wholesaler and manager of water resources in the county, the District conserves, imports, treats, distributes, reclaims, and is responsible for the quality of water in the county. To meet its water supply objectives, the District constructed and now operates and maintains a countywide conservation and distribution system to convey raw water for recharge and treatment.

- Reservoir Storage: The District currently operates and maintains ten local reservoirs which conserve local runoff for either local recharge or treatment at one of the District's three water treatment plants. Five of the ten local water conservation reservoirs are within the Guadalupe River watershed, as shown on Figure 1.1. The Calero/Almaden reservoir systems have the ability to deliver raw water to one of three water treatment plants.

- Artificial Groundwater Recharge Program: The District owns and operates over 30 recharge facilities in 6 major recharge systems. These recharge facilities percolate local or imported water into the groundwater basin. The Los Gatos and Guadalupe recharge systems are within the Guadalupe River watershed (Figure 2.2). In-stream recharge is enhanced by the construction and operation of temporary dams. Off-stream recharge is performed at percolation ponds that are fed by water diverted from the creeks or by imported water pipelines.

TABLE 2.1
Violations Reported and Acted Upon by District Within Guadalupe River Watershed in the Year 1993

	Types of Violations				
	Encroachments	**Outfalls**	**Dumping**	**Erosion**	**Miscellaneous (levee alterations, channel obstructions, etc.)**
Guadalupe River:					
1. San Francisco Bay to Highway 280	1	2	0	0	1
2. Highway 280 to Blossom Hill Road	8	1	3	0	0
3. Blossom Hill Road to limit of jurisdiction	0	0	0	0	0
Los Gatos Creek	0	0	2	0	0
Canoas Creek	1	6	7	2	0
Ross Creek	10	3	2	1	0
Alamitos Creek	0	0	4	0	1
Calero Creek	0	0	0	0	1

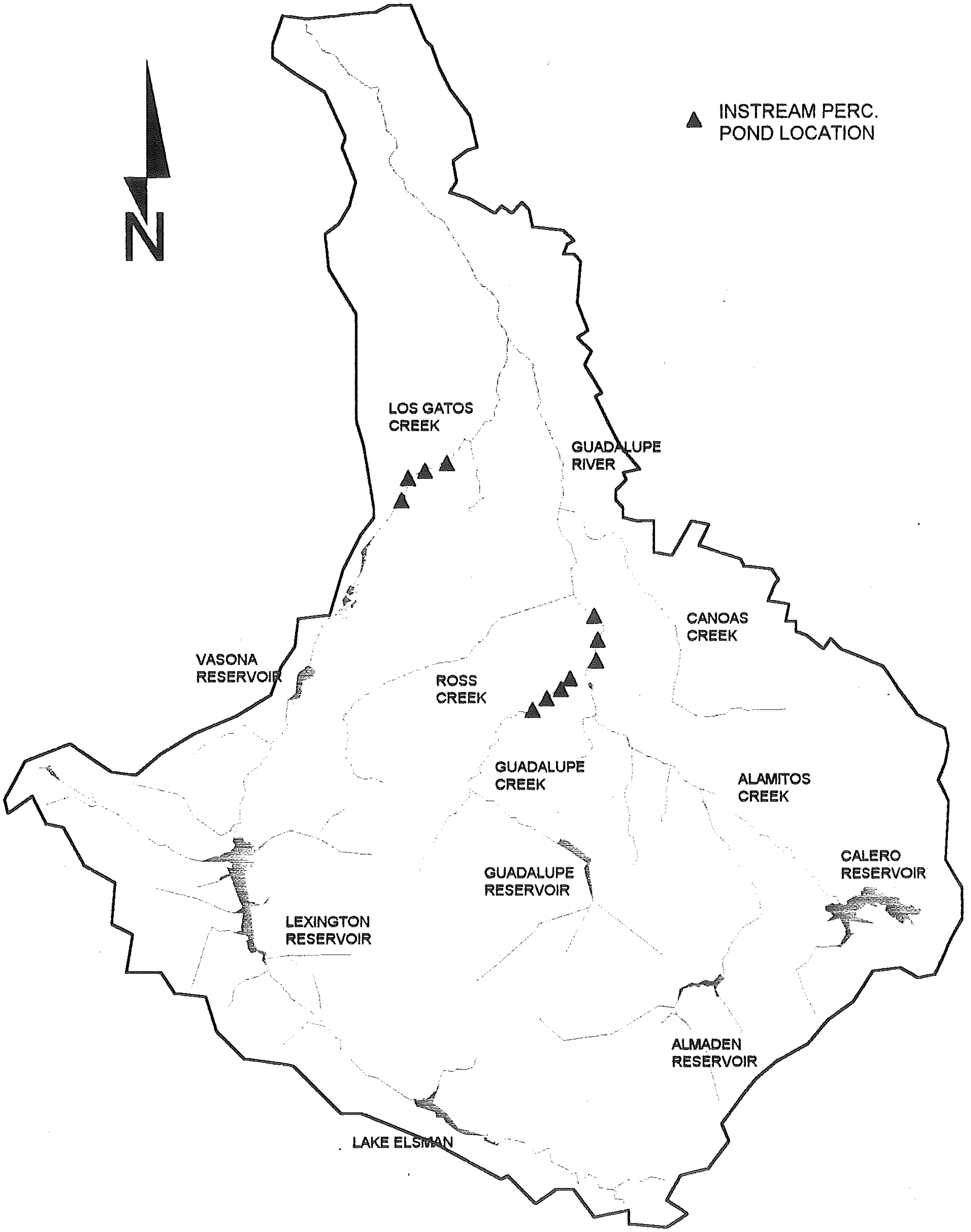


FIGURE 2.2 - INSTREAM PERCOLATION POND SITES WITHIN THE GUADALUPE RIVER WATERSHED

City of San Jose

The San Jose City Council adopted the Horizon 2000 General Plan for the City in 1984. The Plan seeks to balance natural resource conservation and urban development so as to maximize the achievement of environmental, economic, and social needs. Figure 2.3 shows the Horizon 2000 General Plan in the Guadalupe River watershed. The legend is shown in Figure 2.4.

The City plans to protect water resources wherever possible. Policy No. 3 of the City's Water Resources Goals and Policies states: "Protect water resources because they are vital to ecological and economic health of the region and its residents. The City, in cooperation with the District, should restrict, or carefully regulate, public and private development in watershed areas, especially those necessary for effective functioning of reservoirs, ponds, and streams, and for the prevention of excessive siltation. The City should protect important groundwater recharge areas, particularly creeks and creeksides, from urban development."

The City also plans to preserve riparian resources wherever feasible. Policy No. 5 of the City's Marinelife and Wildlife Resources goals and Policies states: "Preserve areas of special marine and wildlife habitation, particularly those containing endangered species, as living research and recreational resources, and as indispensable parts of the total environment. Any development involving unmitigated adverse impacts on the National Wildlife Refuge in south San Francisco Bay should not be permitted. Consideration should be given to setting aside nature preserves in the Bay, marshes, streamsides, streambeds, and hillside areas to protect habitats of essential, rare and endangered species of plants and animals, and to provide areas for educational and research purposes."

The City is also developing a riparian corridor policy which analyses balancing long-term environmental protection and continued land development.

The City is a participant in the Santa Clara Valley Nonpoint Source Pollution Control Program and a co-permittee with 14 other agencies in the Santa Clara County for the NPDES permit issued by EPA to the program in June of 1990. As a participant in the Nonpoint Source Program, the City is responsible for implementing program elements in its area of jurisdiction and must submit an annual report to be included in the Santa Clara Valley NPDES annual report.

Santa Clara County

The Santa Clara County (County) General Plan (1990) has a few protective measures in reference to creeks and streamside areas in its Natural Environment, Lands Use and Public Safety Elements. Some of them are:

- Public projects shall be designed to avoid damage to the stream environments.
- Where possible, riparian woodlands, marshes and floodplains which have been altered should be allowed to return to a natural state.
- In floodplains which are not already developed, land uses shall be restricted to avoid need for major flood control alterations to the streams.
- Public projects should preserve the stream environment and should provide multiple use for such purposes as parks, open space preserves, trails and flood control.

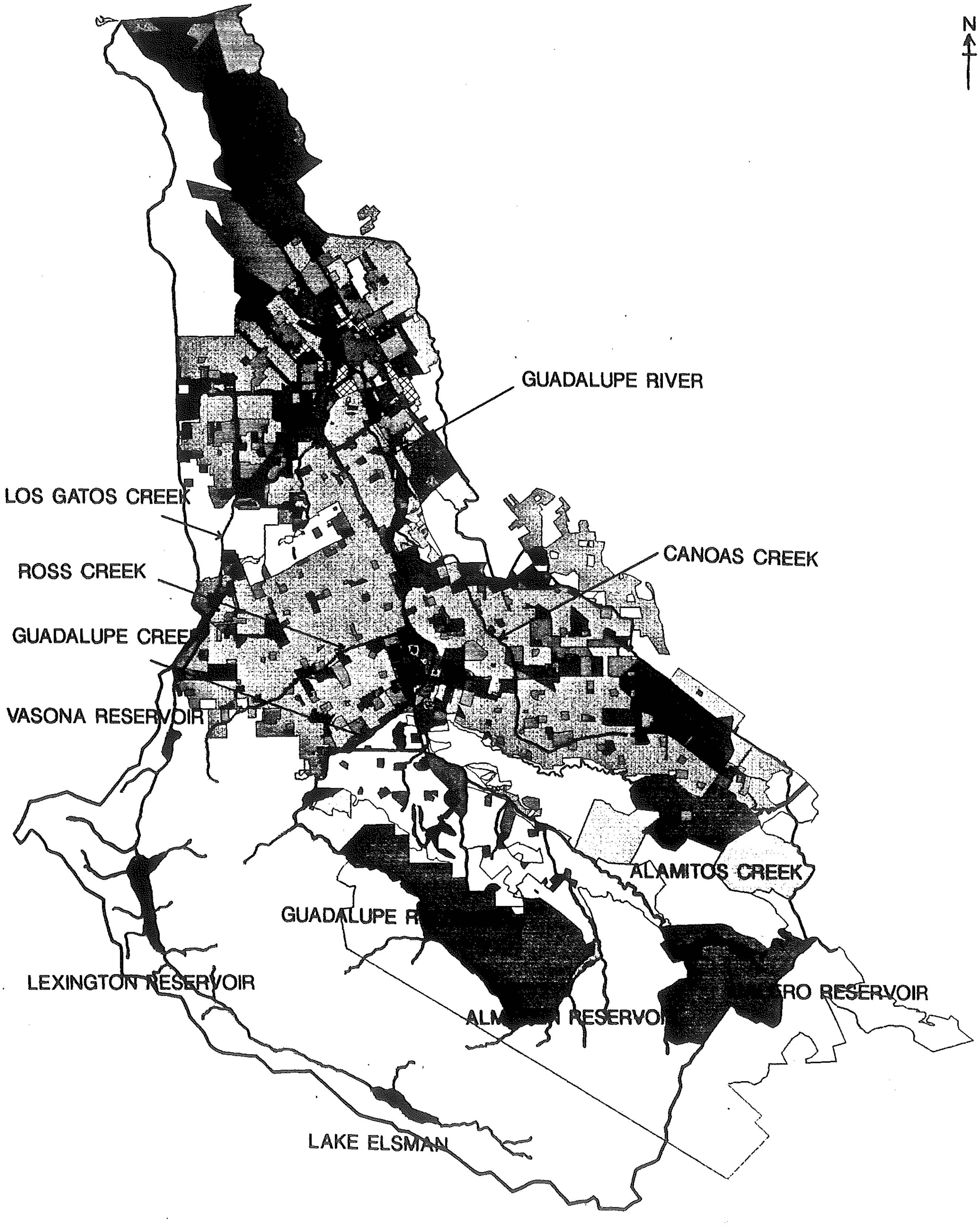


FIGURE 2.3: CITY OF SAN JOSE'S GENERAL PLAN WITHIN GUADALUPE RIVER WATERSHED

Horizon 2000

Land Use/Transportation Diagram

- ▒ Rural Residential
- ▒ Estate Residential
- □ Low Density Residential
- □ Medium Low Density Residential
- ▒ Medium Density Residential
- ▓ Medium High Density Residential
- ■ High Density Residential
- ■ Very High Density Residential
- ▦ Residential Support for the Core Area
- ⬚ Planned Residential Community
- ⬚ Urban Reserve
- ▣ Area of Historic Sensitivity

- ▓ Neighborhood Business District
- ■ Neighborhood/Community Commercial
- ■ Residential Commercial
- ■ General Commercial
- ■ Office
- ■ Core Area Commercial
- ▤ Research Development
- ■ Administrative Office/ Research & Development
- ■ Campus Industrial
- ■ Industrial Park
- ▒ Light Industrial
- ■ High Industrial

- ■ Combined Industrial/Commercial
- ▤ Public/Quasi-Public
- ▤ Public Park/Open Space
- □ Private Open Space
- □ Floating Public Park
- ■ Public Recreation
- □ Non-Urban Hillside
- ▒ Agriculture
- ▩ Coyote Greenbelt
- ▧ Mixed Use
- ▩ Airport Approach Zone
- ■ Candidate Solid Waste Disposal Site

FIGURE 2.4 : LEGEND

State Regulations

Streambed Alteration Agreements: California Fish and Game Code Section 1601/1603

Any person, governmental agency, state or local, and public utility proposing a project which will diverts, obstructs or change the natural flow or bed, channel, or bank of any river, stream or lake must give notice to the CDFG under Sections 1601 (public) and 1603 (private) of the California Fish and Game Code.

California State Water Resources Control Board

The California State Water Resources Control Board (SWRCB) is responsible for the quality of the water in the state waterways. The nine RWQCBs that implement the policies of the SWRCB, make policy recommendations and issue permits to improve water quality. The San Francisco Regional Board has issued three general NPDES permits which are applicable in the Guadalupe River watershed.

NPDES General Industrial Activity Stormwater Permit

This permit applies to storm water discharges by certain regulated industries. Federal law requires that industrial storm water discharges meet all provisions of Section 301 and 402 of the Federal Clean Water Act in order to control pollutant discharges. These provisions require the use of best available technology economically available and best conventional pollution control technology to reduce pollutants and any more stringent controls necessary to meet water quality standards.

NPDES General Construction Activity Stormwater Permit

This permit is required of all construction projects disturbing five or more acres of land area. BMPs to control storm water runoff both during and after construction are required.

NPDES Municipal Stormwater Permit

Municipalities with a population over 100,000, or those that have been determined to be significant contributors of pollutants, are required to obtain NPDES municipal storm water permits. The applicants are required to collect existing information regarding storm water discharges and receiving water quality, provide adequate fiscal resources, and prepare a storm water management program. The Guadalupe River watershed falls within the jurisdiction of the NPDES permit issued to the Santa Clara Valley Nonpoint Source Pollution Control Program.

Federal Regulations

The Rivers and Harbors Act

The Rivers and Harbors Act was enacted by Congress in 1899 to protect interstate commerce in navigable waters through the regulation of streams and rivers. Sections 9 and 10 of the Act relate to protecting navigable waters. Section 9 of the Rivers and Harbors Act requires an applicant to obtain a permit to construct a dike or dam in navigable waters of the United

States. Under Section 10, the Corps regulates projects or construction of structures in or over any navigable water of the United States, including the excavating from or depositing of material in any such waters. Limits of navigable water jurisdiction in Guadalupe River extend up through the upstream end of this project.

Fish and Wildlife Coordination Act

The Fish and Wildlife Coordination Act was established to protect the quality of the aquatic environment as it affects the conservation, improvement and enjoyment of fish and wildlife resources. The Fish and Wildlife Coordination Act requires that any federal agency that proposes to control or modify any body of water must first consult with the U.S. Fish and Wildlife Service (USFWS) and the National Marine Fisheries Service (NMFS).

Endangered Species Act (Section 7)

The federal Endangered Species Act requires federal agencies, in consultation with the NMFS and the USFWS, to ensure that their actions do not jeopardize the continued existence of endangered or threatened species or result in the destruction or adverse modification of the critical habitat of these species.

The State Endangered Species Act requires agencies to consult formally with DFG when the proposed action may affect state-listed endangered or threatened species.

Clean Water Act

The Clean Water Act was enacted by Congress in 1972 and its goal was to "restore and maintain the chemical, physical, and biological integrity of the Nation's waters." To meet this objective, Section 301 of the Clean Water Act prohibits the discharge of any pollutants into navigable waters, except what is allowed by permits issued under Sections 402 and 404.

Sections 401, 402, and 404 of the Clean Water Act

Section 401 addresses effluent standards and water quality standards by requiring, in addition to a dredge and fill discharge permit, water quality certification from the SWRCB.

Section 402 authorizes the U.S. Environmental Protection Agency (USEPA) to issue permits under procedures established to implement the NPDES program.

Section 404 authorizes the Corps to issue permits for and regulate the discharge of "dredge or fill materials into waters of the United States." Waters of the United States include:

- all waters which are currently used, or which were used in the past for commerce, including waters which are subject to the tide;
- all interstate waters, including lakes, rivers, streams, intermittent streams, sloughs, and natural ponds;

- all impoundments of water;
- tributaries of waters; and
- wetlands adjacent to waters.

Once an area has been identified as a federal water and a permit is applied for, an environmental assessment is required under the National Environmental Policy Act. The NMFS and USFWS review and comment on all Section 404 permit applications. In addition, the RWQCB is responsible for certifying Section 404 permits as being in compliance with state water quality standards.

Coastal Zone Act Reauthorization Amendments of 1990

The Coastal Zone Management Act was originally passed by Congress in 1972 to voluntarily develop comprehensive programs to protect and manage coastal resources. To receive Federal approval and implementation funding, States had to demonstrate that they had programs, including enforceable policies, that were sufficiently comprehensive and specific both to regulate land uses, water uses, and coastal development and to resolve conflicts between competing uses. In 1990 Congress enacted the Coastal Zone Act Reauthorization Amendments of 1990 (CZARA). These amendments were intended to address several concerns, one of which is the impact of nonpoint source pollution on coastal water quality.

CZARA guidance specifies two management measures for channel modifications:

- Management Measure for Physical and Chemical Characteristics of Surface Waters
    - Evaluate the potential effects of proposed channel modifications on the physical and chemical characteristics of surface waters in costal areas;
    - Plan and design channel modifications to reduce undesirable impacts; and
    - Develop an operation and maintenance program for existing modified channels that includes identification and implementation of opportunities to improve physical and chemical characteristics of surface waters in those channels.
- Instream and Riparian Habitat Restoration Management Measure
    - Evaluate the potential effects of proposed channel modifications on instream and riparian habitat in coastal areas;
    - Plan and design channel modifications to reduce undesirable impacts; and
    - Develop an operation and maintenance program with specific timetables for existing modified channels that includes identification of opportunities to restore instream and riparian habitat in those channels.

National Historic Preservation Act (Section 106)

The National Historic Preservation Act provides the Advisory Council on Historic Preservation power to review and comment on Corps permit applications that could have an effect on historic properties listed in the National Register of Historic Places or those properties eligible for listing.

HISTORIC STREAM CHANNEL

The Guadalupe River played an important role in the settlement of San Jose and, as a result, it has been subjected to many modifications. One of the first modifications completed following the establishment of San Jose as a pueblo in 1777 was the construction of a small dam above the settlement for irrigation purposes. After the dam was destroyed by floods, it was relocated to near the original confluence of Canoas Creek and the Guadalupe River. Canoas Creek formerly flowed through Willow Glen and combined with the Guadalupe River near Auzerais Avenue, about 3 miles downstream of the present confluence.

Following the discovery of gold in California in 1849, Santa Clara County experienced steady growth. Grain farming was the primary agricultural pursuit during the 1850s while gristmilling began as one of the early industrial developments. The first water-powered mill was built sometime prior to 1840 near the old Guadalupe-Canoas confluence. The area from Interstate 280 to Southern Pacific Railroad (SPRR) was known historically as Gulnac's Island.

Further upstream on the Guadalupe River was an area subject to annual flooding known as "The Willows" (Willow Glen) because of the many willow trees that grew there. Sometime after 1866, a canal was dug from Willow Glen Way to near Willow Street in order to alleviate flooding and improve conditions for the rapidly expanding orchards. This canal was known as Lewis Canal, probably because of the landowner Frank Lewis. The Lewis Canal is the present stream channel of the Guadalupe River from Willow Glen Way to Willow Street and is noticeably straighter than both the upstream and downstream stream channel. A 1939 aerial photograph of the Guadalupe River is shown on Figure 2.5.

More recently, Canoas Creek and Ross Creek were realigned to flow into the Guadalupe River. Canoas Creek outfall was moved from downstream of Auzerais Avenue to about 1,500 feet upstream of Curtner Avenue in 1960, and Ross Creek outfall was moved from near Koch Lane to 1,000 feet downstream of Branham Lane in 1955.

In 1975, as part of Almaden Expressway construction project, about 3,000 feet of channel beginning at Almaden Road was widened and moved eastward. The San Jose Water Company (SJWC) well field and redwood tank located in the center of the expressway near Koch Lane identifies the previous location of the west bank of the river. The river was realigned in order to build the northbound expressway.

Between Branham Lane and Blossom Hill Road, the original stream channel was excavated as part of a gravel quarry operation. That channel was enlarged to a trapezoidal section with a 120-foot bottom width.

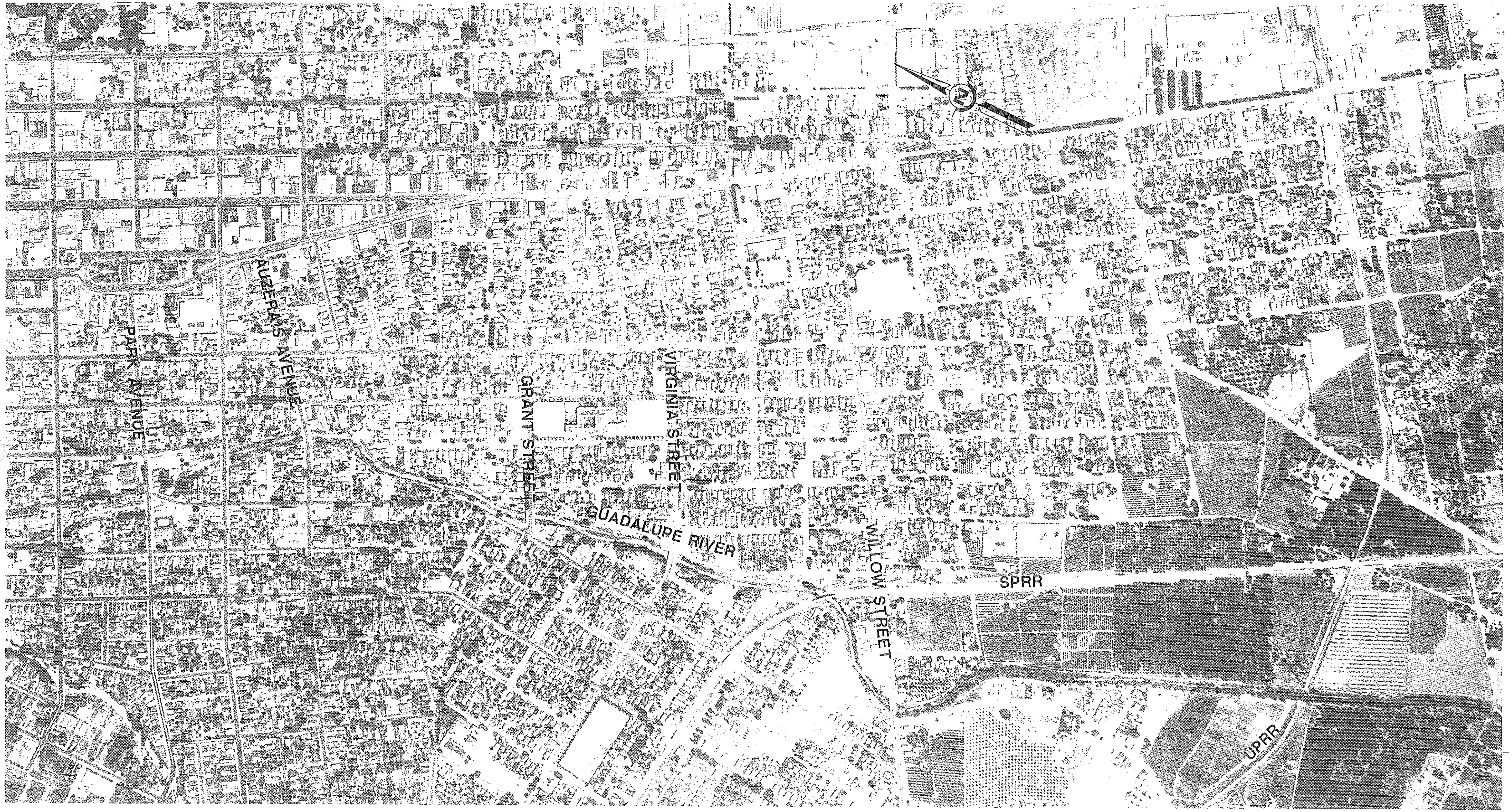


Figure 2.5 1939 Aerial Photograph Of The Guadalupe River.

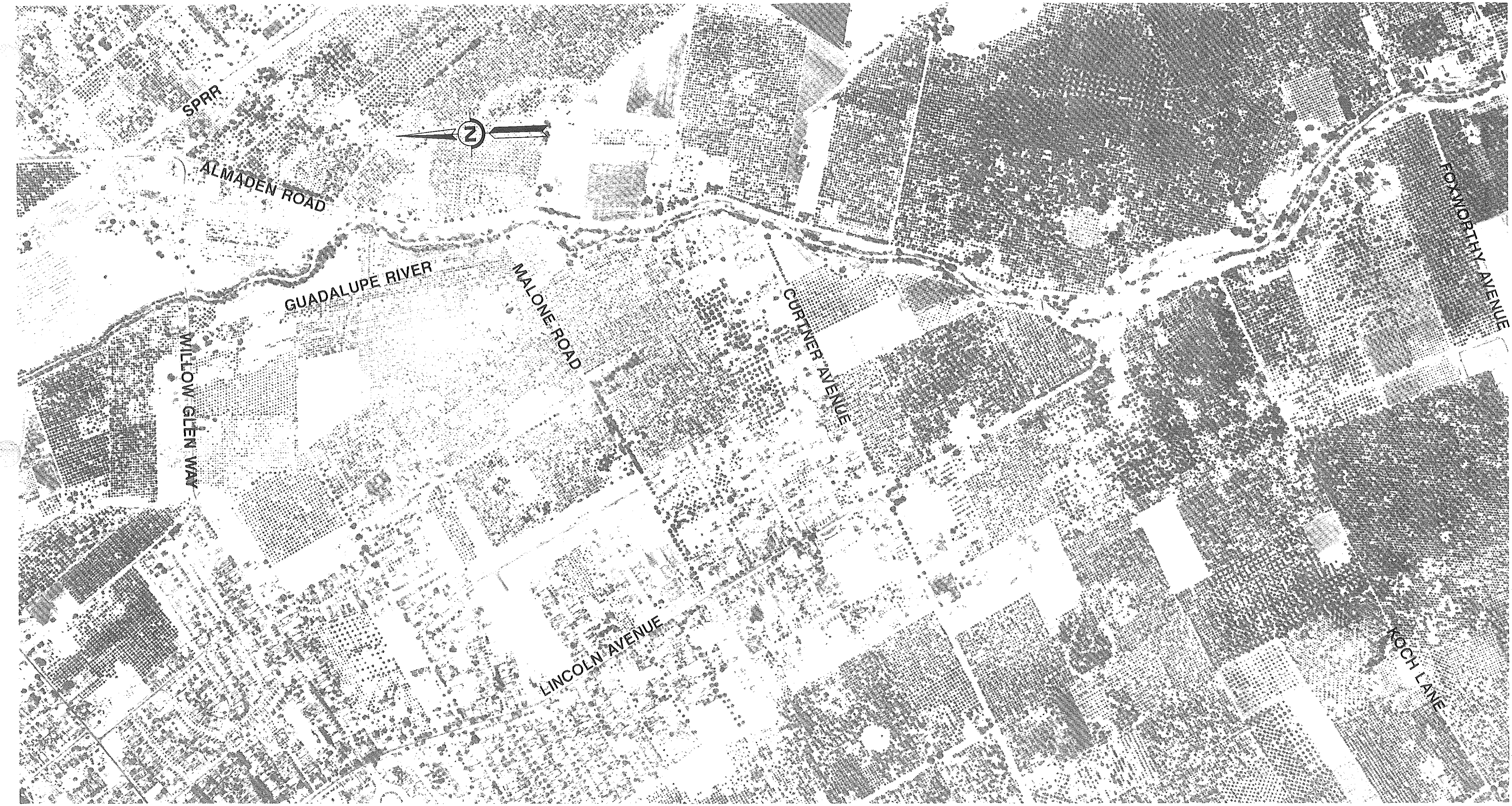


Figure 2.5 1939 Aerial Photograph Of The Guadalupe River.

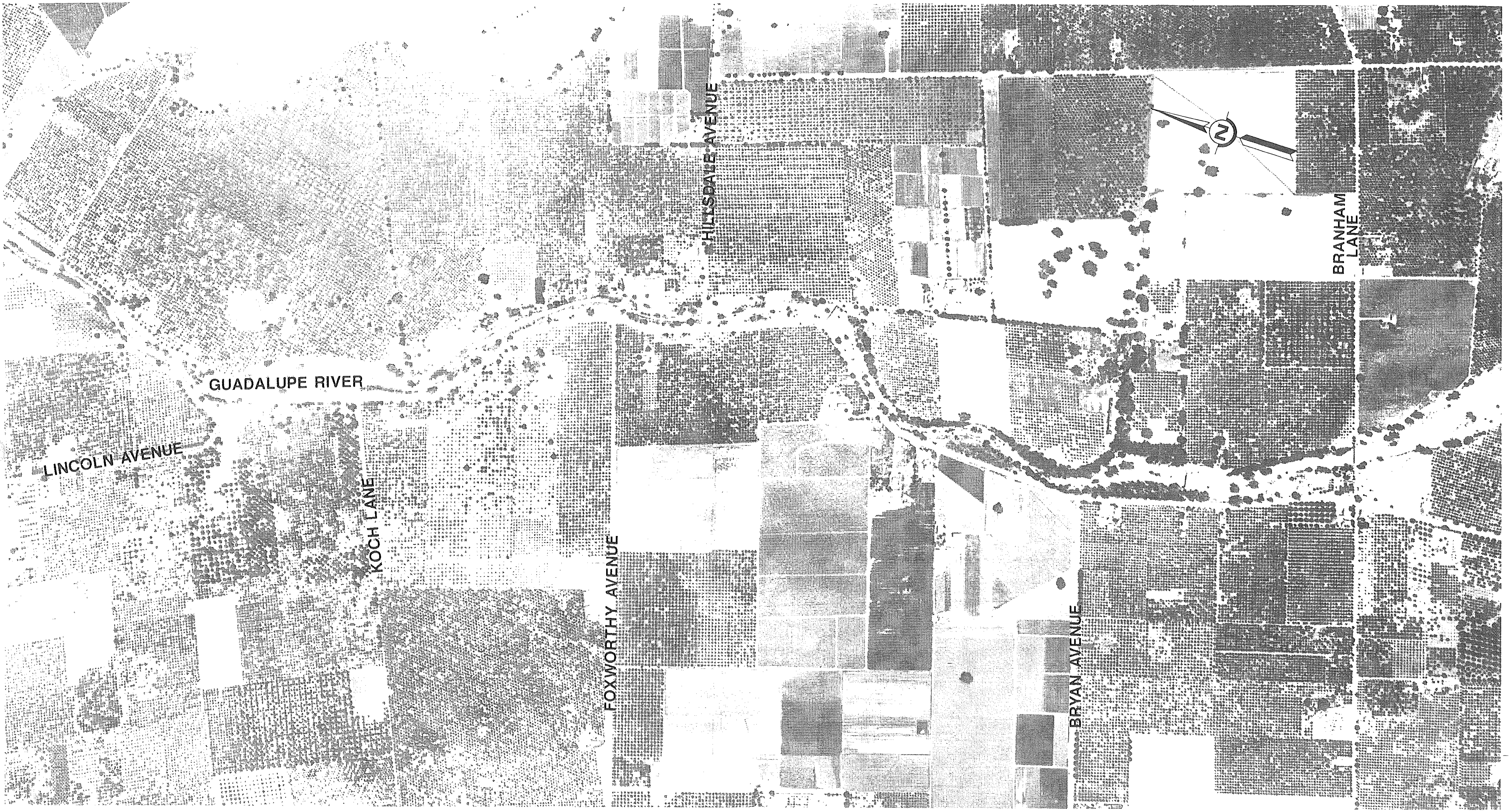


Figure 2.5 1939 Aerial Photograph Of The Guadalupe River.

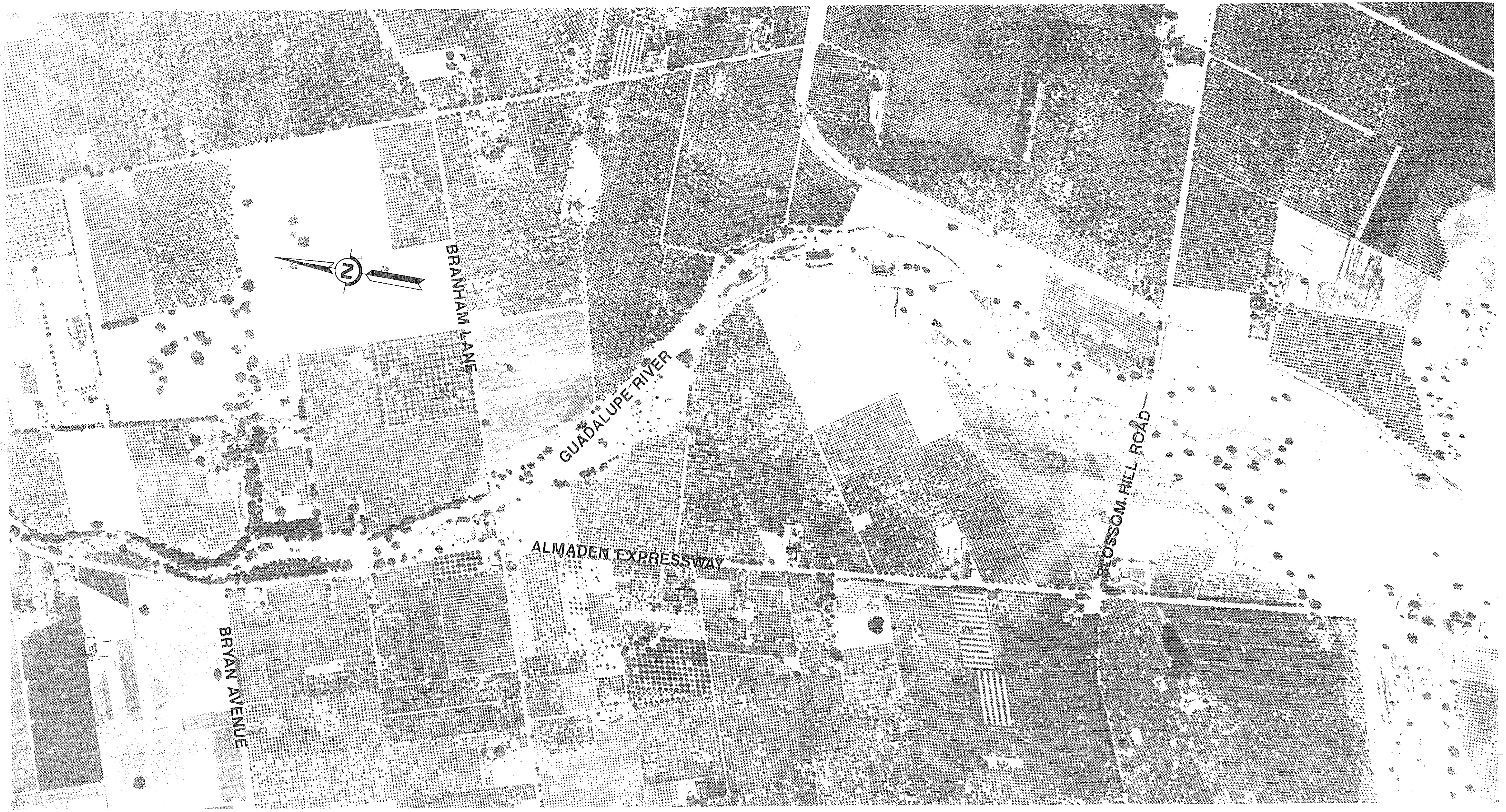


Figure 2.5 1939 Aerial Photograph Of The Guadalupe River.

HISTORIC LAND SUBSIDENCE

Historic land subsidence has occurred in the Santa Clara Valley as a result of overdraft pumping of groundwater basin. It is estimated that between 1934 and 1967, the ground level in the Santa Clara Valley subsided to a maximum of 8 feet centered in an area southeast of downtown San Jose (see Figure 2.6). This led to the collapse of many well casings that were constructed to the deep groundwater confined zone. Structures that rely on hydraulic gravity flow such as sewer and storm drain lines and creeks were also impacted. However, other structural facilities such as highways and buildings were not impacted as land subsidence occurs on a gradual basis and covers a large area. Since 1969, due to the successful management of water supply by the District to balance the ever-increasing demand for water in the Santa Clara County, land subsidence has stopped. Water imported through the South Bay Aqueduct of the State Water Project has also allowed the reduction in groundwater pumping from the groundwater basin.

Land subsidence caused the southern shoreline of the San Francisco Bay to drop below sea level. As a result, levees were constructed along the bay front and along the tributary streams to prevent saltwater flooding in the baylands. In the areas that subsided below the sea level and the areas behind the levees, local drainage runoff has to be pumped over the levees and into the creeks and the bay.

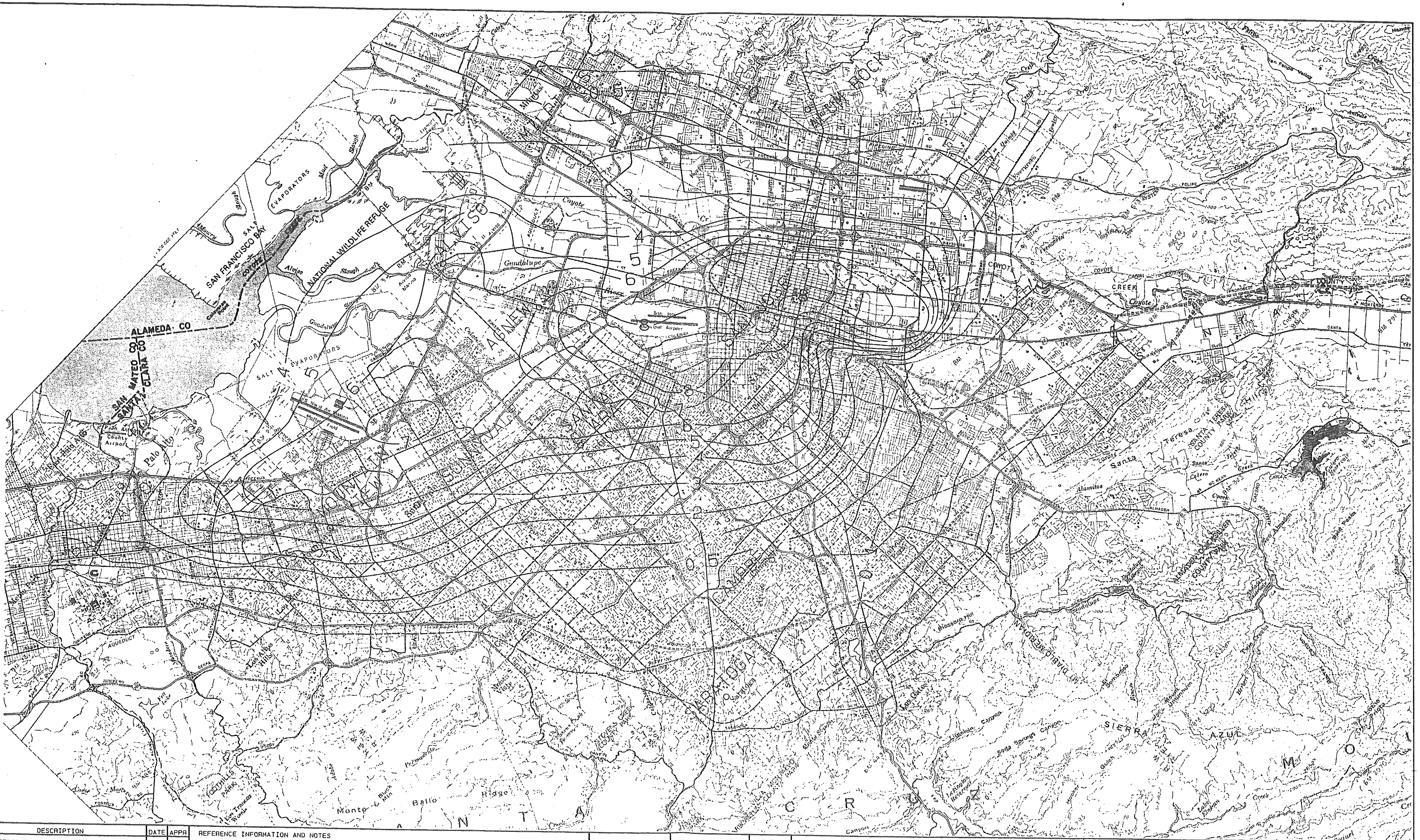
Land subsidence has also allowed the incursion of tidal saltwater from the Bay as far upstream as Trimble Road in the lower Guadalupe River. This incursion has posed a threat to the shallow aquifer from saltwater intrusion in the lower Guadalupe River.

PROBLEM DEFINITION

Water Quality

Water quality degradation can be caused by agricultural activities, commercial and industrial activities including leaking underground storage tanks and spills, land alteration including commercial and residential development, wetland and riparian area degradation, urban runoff, and transportation activities. Some of these activities threaten the current water quality in the Guadalupe River watershed.

In recent years, leaking underground tanks and industrial spills have threatened groundwater quality in the watershed area. At various locations in the watershed, motor fuels have leaked from storage tanks into soil and shallow groundwater aquifers. For example, more than 600 fuel leak sites were identified within the Guadalupe River watershed in the District's Fuel Leak Site Activity 1993 Fourth Quarter Report. Figure 2.7 shows the location of those sites. Several hundred of these sites involved groundwater contamination.



REV	DESCRIPTION	DATE	APPR
1st	ENTERED INTO CADD	1/91	

REFERENCE INFORMATION AND NOTES

1. CONTOUR LINE INTERVALS ARE IN FEET.
2. LOCATION OF SUBSIDENCE LINES IS APPROXIMATE.

DATE
4/1/91
DESIGN

DRAWN
CM/BS
CHECKED
RT

Santa Clara Valley Water District

FIGURE 2.6

LINES OF EQUAL SUBSIDENCE
SANTA CLARA VALLEY
NORTH COUNTY
1934-1967

SCALE
1"=5000'±
SHEET
1
1 OF 1

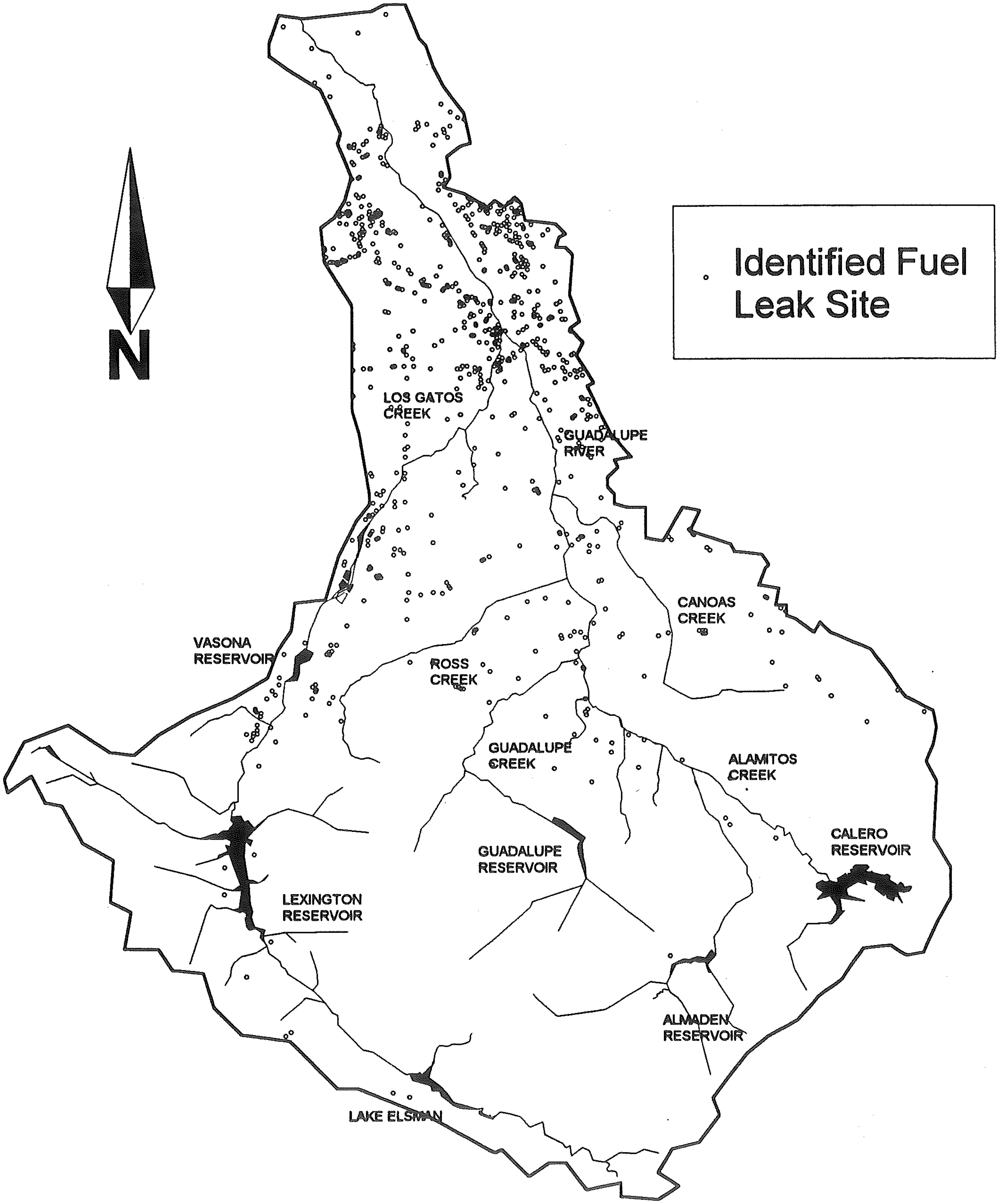


Figure 2.7 - Fuel Leak Sites Within The Guadalupe River Watershed

Nonpoint source pollution is another major threat to water quality in the Guadalupe River and South San Francisco Bay. Pollutants from exposed soil, roofs, streets, parking lots, freeways, illegal outfalls, illegal dumping, construction and industrial sites, and various other man-made surfaces are washed into storm drains, creeks, and eventually into the Bay. These pollutants include sediment, oils, grease, heavy metals, pesticides, and organic chemicals, which may be hazardous to aquatic and human life when they enter the food chain and are consumed by wildlife or humans.

In the past, wastewater treatment plants were seen as the primary source of water pollutants. Nationwide studies over the last 15 years, however, have revealed that runoff from urban areas contains the same pollutants found in discharges from sewage treatment plants (point sources). In addition, water pollution from nonpoint sources has increased relative to point sources as a result of improved equipment and wastewater treatment plant operations. Annual loads were estimated for the three Lower South Bay wastewater treatment plants (San Jose, Sunnyvale, and Palo Alto Publicly Owned Treatment Works [POTW]), based on 1987 and 1988 self-monitoring effluent data, and are compared with the estimated mean annual load from nonpoint sources. The result is in Figure 2.8, which indicates that nonpoint sources are a significant contributor of chromium, copper, lead, nickel, zinc and sediment. Further studies have shown that the relative loading of copper per year from the POTWs is less than 4,000 pounds while nonpoint sources contributes about 17,000 pounds/year. Significant sources of nonpoint source copper are wear and tear of automotive brake pads and sediment.

Table 2.2, from 1991 Loads Assessment Report done by the Santa Clara Valley Nonpoint Source Pollution Control Program (NPS Program), presents the estimated annual loads of metals and organics to San Francisco Bay by watershed. The Guadalupe watershed contributes an estimated 30 to 40 percent of the metals and organics discharged to the Bay from Santa Clara County.

The creekbed sediments in the Guadalupe River were sampled at ten locations in the project area. Two sediment samples were also collected near Highway 237, 7.5 miles downstream of the project area for sediment properties comparison. The sample locations are shown in Figure 2.9. The sediment samples were tested for the presence of EPA priority pollutant heavy metals, organochlorine pesticides, polychlorobiphenyls (PCBs), volatile and semivolatile organic compounds (VOCs and SVOCs), chlorinated herbicides, Total Petroleum Hydrocarbons as Gasoline (TPHG), Total Petroleum Hydrocarbons as Diesel (TPHD), and Total Recoverable Petroleum Hydrocarbons (TRPH). Test data were compared with the Puget Sound Sediments Quality Standards (Washington State Department of Ecology, 1991) and background levels identified in the watershed. In all the sediment samples collected, none exceeded the Puget Sound criteria except for two samples in Mercury concentrations. However, the average Mercury concentrations detected in all the samples is lower than the minimum cleanup level of the Puget Sound criteria. The range of results is compared to the criteria and other results in Tables 2.3 and 2.4. The type of chemicals and range of concentrations detected in the sediment in the Alviso Slough area are not significantly different from the sediment in the project area. The range of metals concentrations detected is also consistent with the concentrations detected in the Adobe Creek, Calabazas Creek, and Guadalupe and South Bay Stations, which are summarized in Table 2.5.

In support of the Nonpoint Source Pollution Program, a survey was conducted of all storm water outfalls into the Guadalupe River watershed in the study area to identify any illicit connections. City of San Jose's records were examined and supplemented with two field surveys.

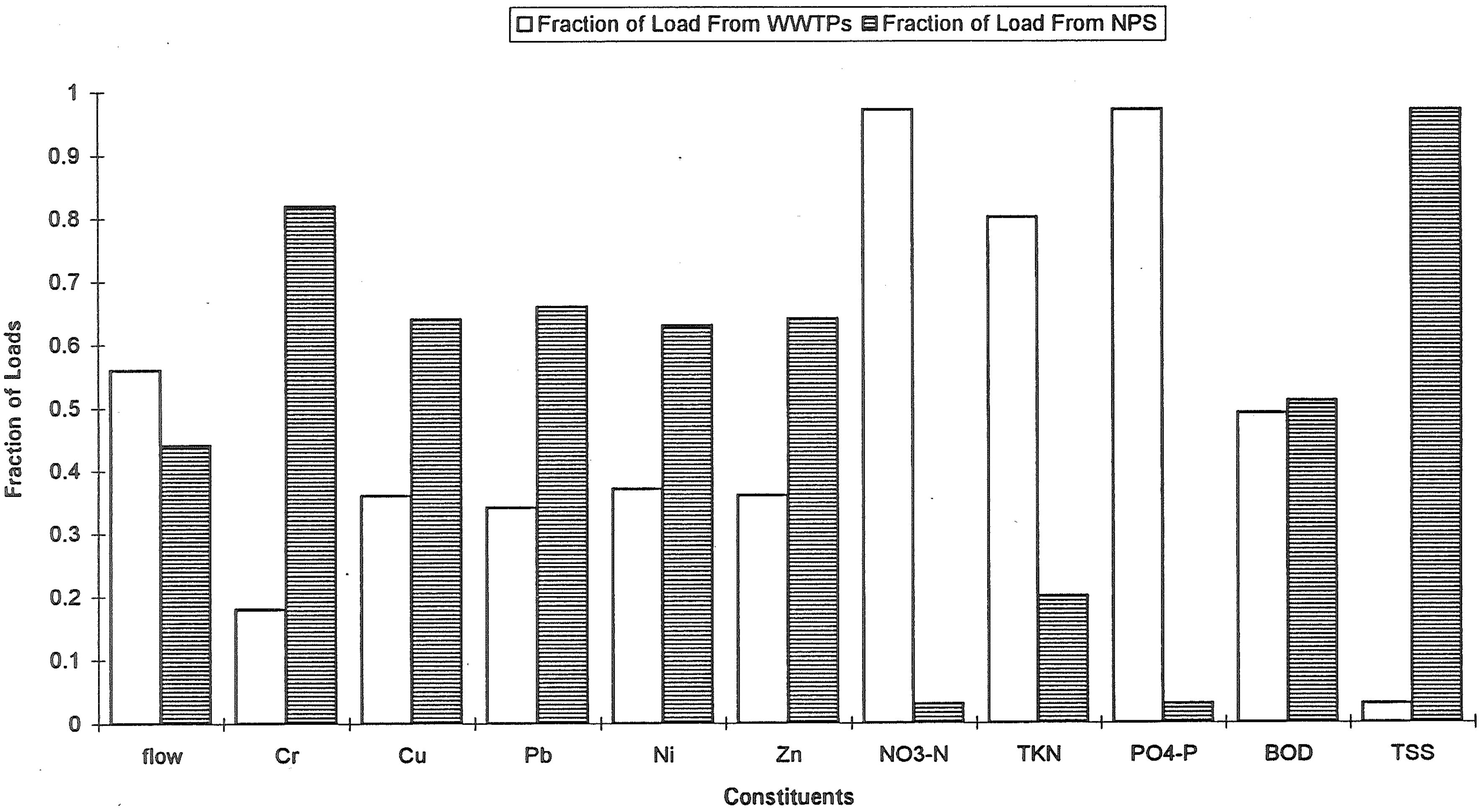


FIGURE 2.8

Figure 10 - Point vs. Non-Point Source Loads
(From 1991 Loads Assessment Report)

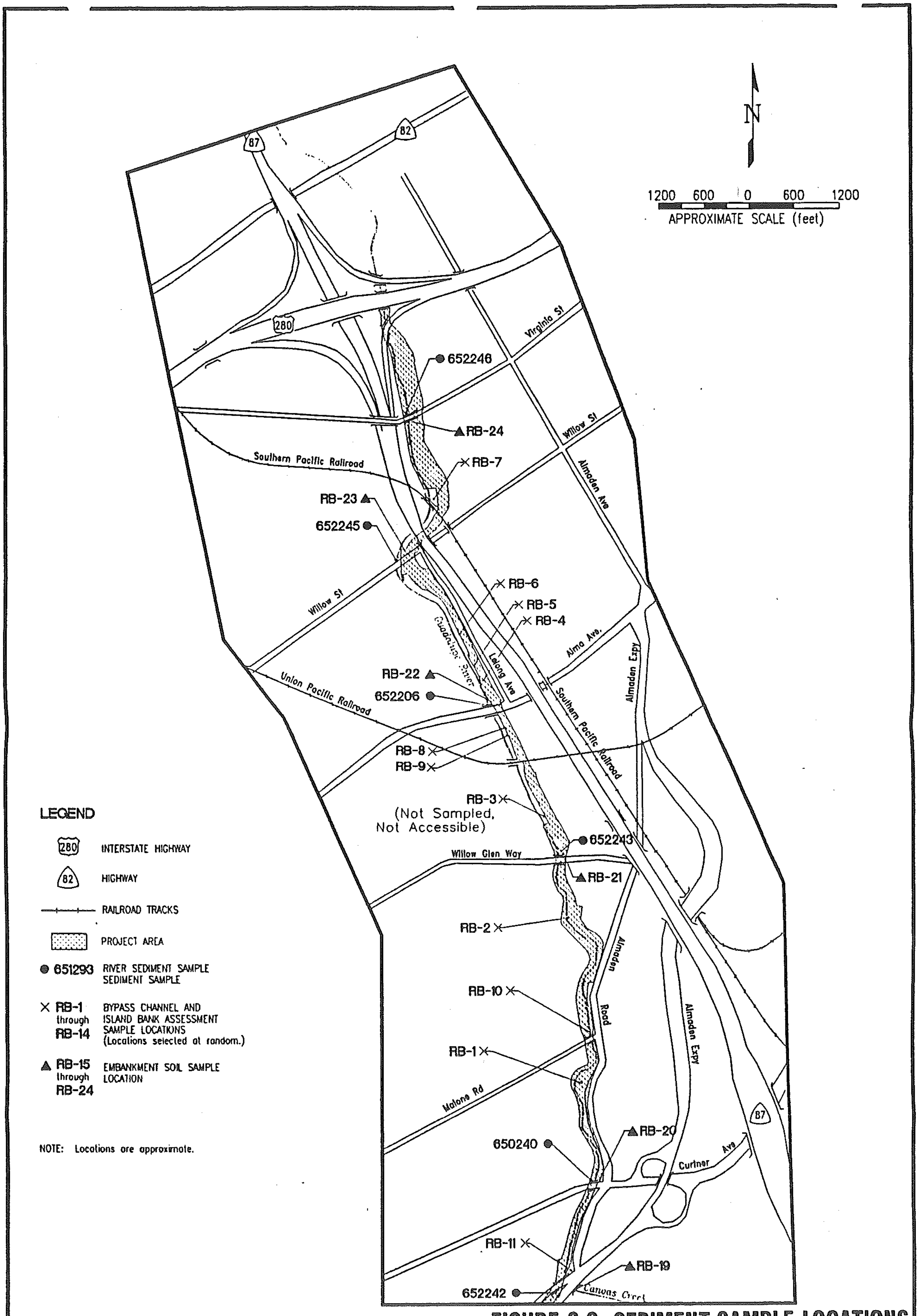


FIGURE 2.9: SEDIMENT SAMPLE LOCATIONS

KLEINFELDER

PROJECT ALIGNMENT (NORTH) WITH
MISCELLANEOUS SAMPLING LOCATIONS

GUADALUPE RIVER PROJECT
SAN JOSE, CALIFORNA

PLATE
4.1a

DRAFTED BY: L. Sue DATE: 11-16-94
CHECKED BY: C. Kennedy DATE: 1-19-95
PROJECT NO. 12-178000/803

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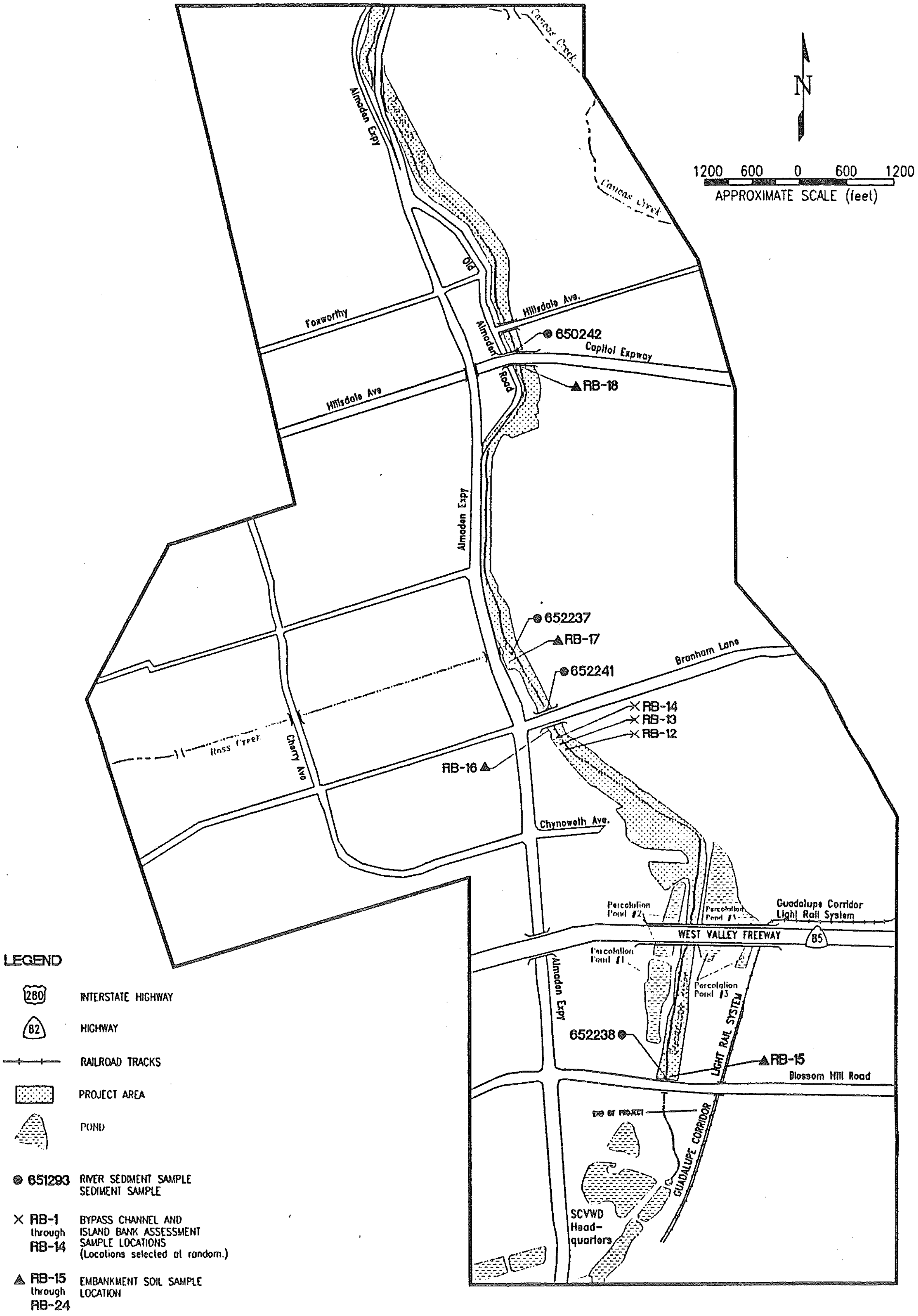
CAD FILE: 12178000\95-JAN\N-AND-S



NOTE: Locations are approximate.

FIGURE 2.9 (CONT'D): SEDIMENT SAMPLE LOCATIONS

KLEINFELDER

PROJECT ALIGNMENT (SOUTH) WITH MISCELLANEOUS SAMPLING LOCATIONS

PLATE 4.1b

GUADALUPE RIVER PROJECT
SAN JOSE, CALIFORNA

DRAFTED BY: L. Sue DATE: 11-16-94

CHECKED BY: C. Kennedy DATE: 1-19-95

PROJECT NO. 12-178000/803

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CAD FILE: 12178000\95-JAN\N-AND-S

TABLE 2.2
Mean Average Annual Wet Weather Loads by Watershed

	Total	Flow (acre-feet)				Cadmium (lbs/year)				Chromium (lbs/year)			
		Ind	Res	Open	Total	Ind	Res	Open	Total	Ind	Res	Open	Total
Adobe, Barron, and Matadero	34	0	6,485	1,511	7,997	0.0	38.8	3.1	42.0	0	713	79	791
Calabazas	21	0	5,071	663	5,734	0.0	30.4	1.4	31.7	0	557	35	592
Coyote	123	1,357	6,085	5,904	13,345	27.7	36.4	12.3	76.4	276	669	307	1,252
Guadalupe	90	2,170	15,649	8,108	25,927	44.3	93.7	16.8	154.9	442	1,719	422	2,583
Los Gatos	18	0	2,764	283	3,047	0.0	16.6	0.6	17.1	0	304	15	318
Permanente	18	0	1,567	3,146	4,713	0.0	9.4	6.5	15.9	0	172	164	336
San Francisquito	8	0	552	846	1,398	0.0	3.3	1.8	5.1	0	61	44	105
San Tomas	27	1,332	5,694	979	8,005	27.2	34.1	2.0	63.4	271	626	51	948
Saratoga	17	0	938	4,634	5,572	0.0	5.6	9.6	15.2	0	103	241	344
Stevens Creek	12	0	1,415	130	1,546	0.0	8.5	0.3	8.7	0	155	7	162
Sunnyvale East	7	0	1,677	0	1,677	0.0	10.0	0.0	10.0	0	184	0	184
Sunnyvale West	5	0	1,320	1	1,321	0.0	7.9	0.0	7.9	0	145	0	145
TOTAL	380	4,859	49,218	26,205	80,283	99.3	294.8	54.4	448.5	989	5,407	1,364	7,761

	Total	Copper (lbs/year)				Lead (lbs/year)				Nickel (lbs/year)			
		Ind	Res	Open	Total	Ind	Res	Open	Total	Ind	Res	Open	Total
Adobe, Barron, and Matadero	34	0	1,339	56	1,395	0	1,354	21	1,375	0	1,663	174	1,838
Calabazas	21	0	1,047	24	1,072	0	1,059	9	1,068	0	1,300	77	1,377
Coyote	123	293	1,257	217	1,767	622	1,271	81	1,974	459	1,560	681	2,701
Guadalupe	90	469	3,232	298	3,999	995	3,268	111	4,375	735	4,013	935	5,683
Los Gatos	18	0	571	10	581	0	577	4	581	0	709	33	741
Permanente	18	0	324	116	439	0	327	43	371	0	402	363	765
San Francisquito	8	0	114	31	145	0	115	12	127	0	142	96	239
San Tomas	27	288	1,176	36	1,500	611	1,189	13	1,814	451	1,460	113	2,024
Saratoga	17	0	194	171	364	0	196	64	260	0	241	535	775
Stevens Creek	12	0	292	5	297	0	296	2	297	0	363	15	378
Sunnyvale East	7	0	346	0	346	0	350	0	350	0	430	0	430
Sunnyvale West	5	0	273	0	273	0	276	0	276	0	338	0	339
TOTAL	380	1,051	10,164	964	12,179	2,228	10,279	360	12,867	1,645	12,622	3,023	17,290

	Total	Zinc (lbs/year)				NO3-N (lbs/year)				TKN (lbs/year)			
		Ind	Res	Open	Total	Ind	Res	Open	Total	Ind	Res	Open	Total
Adobe, Barron, and Matadero	34	0	3,598	33	3,632	0	14,232	853	15,085	0	32,673	3,807	36,480
Calabazas	21	0	2,814	15	2,828	0	11,128	374	11,502	0	25,546	1,670	27,216
Coyote	123	4,407	3,377	130	7,914	2,552	13,353	3,332	19,237	5,533	30,655	14,871	51,059
Guadalupe	90	7,050	8,684	179	15,913	4,083	34,342	4,575	43,000	8,851	78,837	20,423	108,112
Los Gatos	18	0	1,534	6	1,540	0	6,065	160	6,225	0	13,924	712	14,637
Permanente	18	0	870	69	939	0	3,439	1,775	5,214	0	7,895	7,925	15,820
San Francisquito	8	0	306	19	325	0	1,211	477	1,689	0	2,781	2,131	4,912
San Tomas	27	4,327	3,160	22	7,509	2,506	12,498	552	15,555	5,433	28,687	2,466	36,586
Saratoga	17	0	521	102	623	0	2,060	2,615	4,675	0	4,728	11,672	16,400
Stevens Creek	12	0	785	3	788	0	3,104	74	3,179	0	7,129	328	7,458
Sunnyvale East	7	0	931	0	931	0	3,680	0	3,680	0	8,448	0	8,448
Sunnyvale West	5	0	732	0	732	0	2,896	1	2,897	0	6,648	2	6,651
TOTAL	380	15,784	27,311	579	43,674	9,141	108,009	14,788	131,937	19,818	247,952	66,009	333,778

	Total	POP4-P (lbs/year)				BOD (lbs/year)				TSS (lbs/year)			
		Ind	Res	Open	Total	Ind	Res	Open	Total	Ind	Res	Open	Total
Adobe, Barron, and Matadero	34	0	13,737	2,028	15,765	0	187,408	22,448	209,857	0	4,897,439	1,274,789	6,172,228
Calabazas	21	0	10,741	890	11,630	0	146,528	9,850	156,378	0	3,829,129	559,356	4,388,485
Coyote	123	6,705	12,889	7,920	27,514	49,789	175,834	87,689	313,312	2,042,272	4,594,967	4,979,611	11,616,851
Guadalupe	90	10,727	33,148	10,877	54,752	79,652	452,206	120,427	652,284	3,267,171	11,817,256	6,838,700	21,923,126
Los Gatos	18	0	5,854	379	6,234	0	79,868	4,201	84,068	0	2,087,145	238,537	2,325,682
Permanente	18	0	3,319	4,221	7,540	0	45,284	46,730	92,014	0	1,183,381	2,653,663	3,837,044
San Francisquito	8	0	1,169	1,135	2,304	0	15,950	12,568	28,517	0	416,800	713,700	1,130,500
San Tomas	27	6,585	12,061	1,313	19,959	48,892	164,545	14,540	227,978	2,005,462	4,299,972	825,713	7,131,147
Saratoga	17	0	1,988	6,216	8,204	0	27,122	68,824	95,946	0	708,769	3,908,307	4,617,076
Stevens Creek	12	0	2,998	175	3,172	0	40,894	1,936	42,830	0	1,068,669	109,932	1,178,600
Sunnyvale East	7	0	3,552	0	3,552	0	48,460	0	48,460	0	1,266,371	0	1,266,371
Sunnyvale West	5	0	2,795	1	2,797	0	38,134	14	38,148	0	996,534	793	997,328
TOTAL	380	24,017	104,292	35,155	163,424	178,333	1,422,233	389,226	1,989,792	7,314,906	37,166,432	22,103,102	66,584,439

TABLE 2.3
ANALYTICAL RESULTS FOR SEDIMENT SAMPLING
HEAVY METALS
UPPER GUADALUPE RIVER PROJECT

(DRY WEIGHT CONCENTRATIONS)

Location	Sample I.D. no.	Units	Date Sampled	Moisture Content	Sb	As	Ba	Be	Cd	Cr	Co	Cu	Pb	Hg	Mo	Ni	Se	Ag	Tl	V	Zn
Alviso Slough																					
Sediment	652240	mg/kg	07/20/94	0.134(a)	1.2	4.6	77.4	0.3	<0.5	58.9	12.7	35.8	55.4	0.23	<1	84.3	<1	<0.5	<1	37.0	107.4
Native soil	652239	mg/kg	07/20/94	0.134(a)	2.3	8.1	242.5	0.6	<0.5	61.2	15.0	35.8	23.1	0.46	<1	88.9	<1	0.7	<1	45.0	69.3
Upper Guadalupe River Project Alignment																					
Virginia St.	652246	mg/kg	07/18/94	0.134(a)	4.6	5.8	113.2	0.3	<0.5	91.2	23.1	90.1	52.0	0.46	<1	138.6	<1	<0.5	2.3	75.1	109.7
Willow St.	652245	mg/kg	07/18/94	0.134(a)	<1	4.6	127.0	0.5	<0.5	52.0	12.7	50.8	48.5	0.23	<1	65.8	<1	<0.5	<1	38.1	73.9
Alma Ave.	652236	mg/kg	07/20/94	0.040	2.1	4.2	72.9	0.2	<0.5	103.1	19.8	29.2	39.6	0.31	<1	114.6	<1	0.7	<1	45.8	104.2
Willow Glen Way	652243	mg/kg	07/20/94	0.078	2.2	7.6	90.0	0.3	<0.5	216.9	23.9	49.9	19.5	0.22	<1	271.1	<1	0.8	3.3	49.9	260.3
Curtner Ave.	650240	mg/kg	07/20/94	0.190	2.5	4.9	107.4	3.7	<0.5	148.1	24.7	42.0	27.2	0.37	<1	172.8	<1	0.7	<1	71.6	111.1
Canoas Creek Confluence	652242	mg/kg	07/20/94	0.049	2.1	6.3	79.9	0.3	<0.5	126.2	22.1	47.3	14.7	0.05	<1	157.7	<1	0.8	2.1	54.7	115.7
Capitol Ave.	650242	mg/kg	07/20/94	0.190	3.7	8.6	395.1	0.6	<0.5	160.5	38.3	44.4	9.9	0.37	<1	234.6	<1	1.1	<1	82.7	81.5
Ross Creek Confluence	652237	mg/kg	07/20/94	0.210	2.5	6.3	122.8	0.4	<0.5	126.6	20.3	57.0	86.1	0.76	<1	177.2	<1	<0.5	<1	62.0	177.2
Branham Ave.	652241	mg/kg	07/20/94	0.065	3.2	5.3	83.4	0.3	<0.5	103.7	20.3	37.4	26.7	0.43	<1	160.4	<1	0.9	<1	55.6	104.8
Blossom Hill Rd.	652238	mg/kg	07/20/94	0.250	5.3	10.7	124.0	0.4	<0.5	160.0	26.7	49.3	24.0	1.87	<1	306.7	<1	<0.5	<1	62.7	101.3
Puget Sound Sediment Standard		mg/kg				57			5.1	260		390	450	0.41				6.1			410
Puget Sound Minimum Cleanup Level		mg/kg				93			6.7	270		390	530	0.59				6.1			960

"a" indicates that the moisture content for the sample was not analyzed and the average value of the eight moisture contents for eight sediment samples collected from the Upper Guadalupe River Project was used.

Conversion from wet weight to dry weight is: Wet weight concentration (mg/kg) / (1 - Moisture Content)

"Puget Sound" indicates Washington State's applicalbe levels for Puget Sound marrine sediment systems

nn:SEDCOM.WK3

TABLE 2.4
ANALYTICAL RESULTS FOR SEDIMENT SAMPLING
ORGANIC COMPOUNDS
UPPER GUADALUPE RIVER PROJECT

Location	Sample I.D. no.	Units	Date Sampled	TPH-G	TPH-D (a,b)	TRPH (b)	Total DDD	Chlordane	Dieldrin	PCBs	Herbicides	VOCs	SVOCs
Alviso Slough													
Sediment	652240	mg/kg	07/20/94	<0.3	200	160	0.02	<0.02	<.003	ND	ND	ND	ND
Native soil	652239	mg/kg	07/20/94	<0.3	14	70	1.51	<0.02	<.003	ND	ND	ND	ND
Alignment													
Virginia St.	652246	mg/kg	07/18/94	<0.3	50	<30	<.003	<0.02	<.003	ND	ND	ND	ND
Willow St.	652245	mg/kg	07/18/94	<0.3	<1	<30	<.003	<0.02	<.003	ND	ND	ND	ND
Alma Ave.	652236	mg/kg	07/20/94	0.30	59	210	<.003	<0.02	<.003	ND	ND	ND	ND
Willow Glen Way	652243	mg/kg	07/20/94	<0.3	140	1300	0.02	<0.02	0.00	ND	ND	ND	ND
Curtner Ave.	650240	mg/kg	07/20/94	<0.3	190	390	<.003	0.01	<.003	ND	ND	ND	ND
Canoas Creek Confluence	652242	mg/kg	07/20/94	<0.3	140	250	0.10	0.01	0.01	ND	ND	ND	ND
Capitol Ave.	650242	mg/kg	07/20/94	<0.3	22	60	<.003	0.06	<.003	ND	ND	ND	ND
Ross Creek Confluence	652237	mg/kg	07/20/94	<0.3	94	420	<.003	0.51	<.003	ND	ND	ND	ND
Branham Ave.	652241	mg/kg	07/20/94	<0.3	93	330	<.003	<0.02	<.003	ND	ND	ND	ND
Blossom Hill Rd.	652238	mg/kg	07/20/94	<0.3	610	1400	<.003	<0.02	<.003	ND	ND	ND	ND
TTLC Standard		mg/kg					1.0	2.5	8.0	50.0			
STLC Standard		mg/l					0.1	0.25	0.8	5.0	0.2		5
TCLP		mg/l						0.03					

"a" Laboratory reports indicate that TPH-D results did not match typical diesel pattern.

"b" Analytical method used to determine TRPH (EPA Method 418.1) and TPH-D (EPA 8015 Modified) are non-selective and do not discriminate between petroleum and non-petroleum products

nn:SEDCOM.WK3

TABLE 2.5
TYPICAL METAL CONCENTRATIONS AND STANDARDS

(DRY-WEIGHT CONCENTRATIONS IN MILLIGRAM/KILOGRAM)

Metal	Puget Sound Criteria (1)	Puget Sound Cleanup Level (2)	Upper Guadalupe River	Adobe Creek (3)	Guadalupe River & South Bay Stations (4)	Calabazas Creek (5)	Naturally Occuring (6)	TTLC/STLC (7)
Antimony			ND - 5.3	ND - 5.2			0.6 - 10	500/15
Arsenic	57	93	4.6 - 10.7	ND - 5.2	0.1 - 1.9	24 - 44	1 - 40	500/5
Barium			72.9 - 395.1	83- 211			100 - 3500	
Beryllium			0.3 - 3.7	0.3 - 0.5			0.1 - 40	75/0.75
Cadmium	5.1	6.7	ND	ND - 2.1	0.12 - 1.9	1	0.01 - 7	100/1
Chromium	260	270	52 - 216.9	36 - 160	120 - 230	ND	5 - 3000	2500/560
Cobalt			12.7 - 38.3	8 - 23		18 - 50	1 - 40	
Copper	390	390	29.2 - 90.1	38.6 - 124.5	39 - 81	25 - 397	2 - 100	2500/25
Lead	450	530	9.9 - 86.1	3.4 - 194.6	18 - 200	24 - 53	2 - 200	1000/5
Mercury	0.41	0.59	0.05 - 1.87	ND - 0.5	0.09 - 0.55	0.02 - 0.12	0.01 - 0.08	20/0.2
Molybdenum			ND	ND - 2.6			0.2 - 5	
Nickel			65.8 - 306.7	75.6 - 198.4	65 - 150	73 - 2247	5 - 1000	2000/20
Selenium			ND	ND	0.12 - 0.41	ND	0.1 - 2	100/1
Silver	6.1	6.1	ND - 1.1	ND - 1.2	1.4 - 2.9	ND	0.1 - 5	100/5
Thallium			ND - 3.3	ND			0.1 - 12	700/7
Vanadium			38.1 - 82.7	81 - 120.5			20 - 500	
Zinc	410	960	81.5 - 260.3	47.7 - 254.5	52 -345	69 - 185	10-300	5000/250

(1), (2) Washington State Department of Ecology, 1991

(3) Terratech Inc., 1994

(4), and (5) Woodward-Clyde Consultants, 1992

(6) Dragun, 1988

(7) Title 22, Code of California Regulations, Section 66261.24

nn:SEDCOM2.WK3

Presented in Tables 2.6, 2.7, and 2.8 are all of the outfalls identified in the study area. Table 2.6 lists all of the permitted outfalls in Guadalupe River and Table 2.7 the unpermitted outfalls. Table 2.8 shows both permitted and unpermitted outfalls for Ross and Canoas Creeks in the project area. In all cases, outfalls are listed by creek station and reach, proceeding upstream through the creeks. All outfalls shown on City plans were assumed to be permitted, whether or not a record of said permit could be found.

Along with a total of 100 permitted outfalls, 56 unpermitted outfalls were identified for Guadalupe River. Ross Creek had 13 permitted and one unpermitted outfall; and Canoas Creek had just one permitted outfall in the project area. Many of the outfalls designated as unpermitted may be older outfalls that the City does not show on the plans. Other outfalls may have been temporarily or permanently abandoned. A list of the unpermitted outfalls was transmitted to the District's Design Coordination Division for further investigation.

Flooding Problems

Historic Flooding Problems

Written history of flooding in Santa Clara Valley begins with the founding of Mission Santa Clara and Pueblo San Jose de Guadalupe in 1777. Floods during the first few years forced both to move to higher ground. For the next century and a half, little was done to monitor the flows or prevent the Guadalupe River from periodically flooding. "History of San Jose" by James and McMurray describes some of these early floods.

> "Floods twice crumbled the mud walls of the rough homes in January and February, 1779. . . . The Los Gatos and Guadalupe Creeks overflowed in severe floods of March 1862 and December 20, 1867—in the latter the Los Gatos Creek cut out its present course. . . . The severest flood of American times (February 8, 1869) washed out much trackages of the new horse railroad which had backed the waters 4-feet deep south of Santa Clara Street. Water also covered an area from Third to Seventh Street."

On March 7, 1911 the San Jose Mercury described the flooding:

> ". . . Canoas and Guadalupe Creek, escaped their boundaries and the situation at midnight began to assume a serious aspect . . . . The creek broke its banks above Humbolt Street and spread over the county to the east for a distance of six blocks to a depth of from 3 to 4 feet."

The storm of December 1955, sometimes called "The Christmas Storm," caused widespread flooding throughout the County. The Guadalupe River inundated 200 acres from Hillsdale Avenue to Robertsville (Branham Lane) and 5,000 acres from the Bay to Brokaw Road. Even though many acres were flooded, the flooding would have been more severe if the upstream reservoirs had not been nearly empty. It was estimated by the Corps that instead of the 5,740 cubic feet per second (cfs) which was recorded, the flow rate would have been about 17,000 cfs.

TABLE 2.6
Guadalupe River Permitted Outfalls

Creek Station	Study Reach	Creek Bank and Location	Size, Type	District I.D.	Invert elev.	Comments
480+00	A	W. Bank U/S of Hwy 101	Two 30"RCP		30.0	Permit # 88328
480+20	A	W. Bank U/S of Hwy 101	6"CMP		31.5	Permit # 88328A
480+90	A	W. Bank U/S of Hwy 101	78"RCP		19.5	
481+40	A	W. Bank U/S of Hwy 101	54"RCP		20.0	
481+40	A	W. Bank U/S of Hwy 101	24"[1]		36.5	Not found.
483+50	A	E. and W. Banks at Airport Island Bridge	Two 6"CMP		34.5	Permit # 85338
486+00	A	W. Bank U/S of Airport Island bridge	36"CMP		24.5	Permit # 80309
487+75	A	W. Bank U/S of Airport Island Bridge	30"CMP		24.0	Permit # 87314
499+50	A	W. Bank U/S of Airport Island Bridge	30"CMP		22.5	
503+95	A	E. Bank D/S of Airport Pkwy	Two 24"RCP		32.0	
508+20	A	W. Bank D/S of Airport Pkwy	21"CMP		28.0	
508+80	A	E. Bank D/S of Airport Pkwy	18"CMP		27.5	Permit # 79314
512+90	A	W. Bank D/S of Airport Pkwy	18"CMP		26.5	Permit # 89320
515+00	A	E. Bank D/S of Airport Pkwy	54"CMP		28.0	Permit # 69325
515+90	A	W. Bank at Airport Pkwy	24"[1]		33.0	
516+30	A	W. Bank at Airport Pkwy	54"[1]		25.0	
521+70	A	W. Bank U/S of Airport Pkwy	48"CMP		32.5	Permit # 78344
544+00	A	W. Bank U/S of Airport Pkwy	48"CMP		32.5	Permit # 75321
549+20	A	E. Bank U/S of Airport Pkwy	66"RCP		34.5	Permit # 70335
549+70	A	E. Bank U/S of Airport Pkwy	66"RCP		35.0	
554+50	A	E. Bank D/S of Hwy 880	[1]		40.0	City outfall, size not shown
564+00	A	E. Bank D/S of Hwy 880	18"CMP		47.5	
569+90	A	W. Bank D/S of Hwy 880	18"CMP		56.0	Not found.
573+20	A	E. bank D/S of Hwy 880	36"[1]		45.0	
574+00	A	W. Bank D/S of Hwy 880	30"[1]		48.5	
575+40	A	W. Bank D/S of Hwy 880	36"[1]		41.5	Not found.
577+50	A	W. Bank D/S of Hwy 880	54"RCP		51.0	

TABLE 2.6
Guadalupe River Permitted Outfalls
(continued)

Creek Station	Study Reach	Creek Bank and Location	Size, Type	District I.D.	Invert elev.	Comments
717+00	6	E. Bank U/S of Grant St	24"RCP	118GAC510	86.5	
727+70	6	E. Bank at W. Virginia St	42"RCP		84.5	
728+40	6	E. Bank at W. Virginia St	8"PVC		89.5	
738+50	6	E. Bank D/S of SPRR	66"CMP		89.5	Matresses block O/F
740+50	7	W. Bank U/S of SPRR	30"RCP		93.0	
743+00	7	E. Bank at Hwy 87	30"RCP		88.5	Permit # 85326
745+10	7	W. Bank U/S of Hwy 87	33"[1]		88.5	Not found.
749+20	7	W. Bank D/S of Willow St	42"RCP		92.5	
749+30	7	E. Bank at Willow St	30"CMP	099GAC110	93.0	
749+95	7	E. Bank at Willow St	15"RCP	099GAC130	100.0	
750+05	7	W. Bank at Willow St	48"RCP	099GAC120	92.0	Permit # 87304
760+75	7	E. Bank U/S of Willow St	24"RCP	099GAC140	97.0	Permit # 88338
761+05	7	W. Bank U/S of Willow St	10"CMP		89.0	
767+50	7	W. Bank D/S of Alma Ave	24"CMP	099GAC180	97.5	
767+50	7	W. Bank D/S of Alma Ave	8"CMP		103.5	Permit # 89322
772+70	7	E. Bank D/S of Alma Ave	15"CMP	099GAC200	100.5	Permit # 90306
772+90	7	W. Bank at Alma Ave	30"CMP	099GAC220	103.5	
775+60	7	W. Bank U/S of Alma Ave	48"CMP	099GAC230	98.5	Permit # 83308
780+75	7	E. Bank D/S of UPRR	54"CMP	099GAC240	98.5	Permit # 68328, not found.
781+90	8	W. Bank U/S of UPRR	15"CMP	099GAC260	100.0	
781+90	8	W. Bank U/S of UPRR	24"CMP	099GAC250	103.5	Permit # 88317
783+40	8	E. Bank U/S of UPRR	10"CMP		110.0	
788+75	8	W. Bank U/S of UPRR	18"CMP		113.0	
795+00	8	E. Bank at Willow Glen Way	54"RCP	099GAC500	110.0	
803+75	9	W. Bank at Pine Ave	18"CMP	099GAC600	115.5	
812+00	9	E. Bank D/S of Malone Rd	18"CMP	099GAC630	116.5	
820+00	9	W. Bank D/S of Malone Rd	10"CMP		125.5	
821+50	9	W. Bank at Malone Rd	33"CMP	099GAC710	112.0	
823+80	9	E. Bank U/S of Malone Rd	66"CMP	099GAC720	111.0	Permit # 77320
830+95	9	W. Bank U/S of Malone Rd	12"CMP	099GAC760	128.0	Permit # 85303
835+00	9	E. Bank U/S of Malone Rd	15"CMP	099GAC800	127.5	

TABLE 2.6
Guadalupe River Permitted Outfalls
(continued)

Creek Station	Study Reach	Creek Bank and Location	Size, Type	District I.D.	Invert elev.	Comments
838+10	9	E. Bank D/S of Curtner Ave	6'X6' RCB		121.5	May be old and no longer in use.
841+45	9	E. Bank D/S of Curtner Ave	15"CMP	099GAC830	133.0	Permit # 78345
842+50	10A	W. Bank at Curtner Ave	42"CMP	099GAC850	118.5	
842+60	10A	W. Bank at Curtner Ave	8"CMP	099GAC860	124.0	
844+50	10A	E. Bank U/S of Curtner Ave	10"ABS		137.0	Not found.
853+00	10A	E. Bank D/S of S. Bound Almaden Expwy	18"CMP		134.0	Not found.
854+00	10A	E. Bank D/S of S. Bound Almaden Expwy	18"CMP		136.0	Not found.
858+75	10B	E. Bank U/S of S. Bound Almaden Expwy	12"CMP		135.0	
868+50	10B	W. Bank D/S of N. Bound Almaden Expwy	36"RCP		129.0	
872+00	10B	E. Bank at N. Bound Almaden Expwy	18"CMP		137.5	
880+00	10B	W. Bank U/S of N. Bound Almaden Expwy	66"RCP	114GAC245	131.5	
882+00	10B	W. Bank U/S of N. Bound Almaden Expwy	Two 18"CMP		145.5	Permit # 69344
885+20	10B	W. Bank U/S of N. Bound Almaden Expwy	18"CMP		137.0	Not found;
886+30	10B	W. Bank U/S of N. Bound Almaden Expwy	24"CMP		140.5	
899+05	10C	W. Bank D/S of Hillsdale Ave	18"CMP	114GAC400	146.0	New rip-rap protection
904+20	10C	W. Bank D/S of Hillsdale Ave	48"CMP	114GAC440	140.0	
906+50	10C	E. Bank at Hillsdale Ave	30"CMP	114GAC460	143.5	Not found.
909+40	10C	W. Bank D/S of Capitol Expwy	54"CMP	114GAC470	141.5	
909+80	10C	W. Bank D/S of Capitol Expwy	36"CMP	114GAC480	141.5	
911+50	11	E. Bank U/S of Capitol Expwy	48"[1]		140.5	Not found.
916+50	11	E. Bank U/S of Capitol Expwy	27"[1]		144.0	Permit # 71312, not found.
925+00	11	W. Bank U/S of Capitol Expwy	15"[1]		150.0	Not found.
929+10	11	W. Bank U/S of Capitol Expwy	15"[1]		150.0	Permit # 73302,
934+00	11	W. Bank U/S of Capitol Expwy	15"[1]		151.5	Approximate elevation
939+00	11	W. Bank D/S of Branham Lane	60"CMP		148.5	
953+50	11	W. Bank D/S of Branham Lane	18"CMP		162.0	Permit # 84309

TABLE 2.6
Guadalupe River Permitted Outfalls
(continued)

Creek Station	Study Reach	Creek Bank and Location	Size, Type	District I.D.	Invert elev.	Comments
959+00	11	W. Bank at Branham Lane	48"CMP	114GAC890	156.0	
959+10	11	E. Bank at Branham Lane	36"CMP	114GAC880	156.0	
966+00	12	E. Bank U/S of Branham Lane	12" and 15"CMP	114GAC950	166.5	
968+90	12	E. Bank U/S of Branham Lane	15"CMP	114GAC970	168.5	Not found.
970+35	12	W. Bank U/S of Branham Lane	48"CMP		159.5	Permit # 71317
984+00	12	E. Bank D/S of Hwy 85	36"CMP	128GAC190	163.0	Permit # 86304
988+50	12	W. Bank D/S of Hwy 85	36"RCP		161.0	Permit # 86304
988+70	12	W. Bank D/S of Hwy 85	12'X10' RCB	128GAC200	162.0	Gated opening
997+50	12	E. Bank at Hwy 85	Two 36"CMP	128GAC300	165.0	Percolation pond outlets
997+75	12	W. Bank at Hwy 85	36"CMP	128GAC310	164.0	Perc. pond outlet
1000+50	12	E. Bank D/S of Blossom Hill Rd	12"CMP		172.0	Permit # 76357
1006+50	12	E. Bank D/S of Blossom Hill Rd	48"CMP	128GAC400	165.0	Permit # 68319
1014+60	12	E. Bank D/S of Blossom Hill Rd	36"CMP	128GAC490	170.0	
1014+95	12	W. Bank D/S of Blossom Hill Rd	48"CMP	128GAC500	175.5	
1015+05	12	E. Bank at Blossom Hill Rd	48"CMP		171.5	Permit # 68324

[1] Unknown size or type

TABLE 2.7
Guadalupe River Unpermitted Outfalls

Creek Station	Study Reach	Creek Bank and Location	Size, Type	District I.D.	Invert elev.	Comments
481+30	A	E. Bank U/S of Hwy 101	24"[1]		25.0	
504+00	A	E. Bank D/S of Airport Pkwy	42"RCP		23.0	
506+50	A	W. Bank D/S of Airport Pkwy	30"[1]		23.0	
568+50	A	E. Bank D/S of Hwy 880	12"CMP		50.0	
716+80	6	E. Bank at Grant St	4"CIP		80.0	Not found.
717+20	6	E. Bank U/S of Grant St	8"CMP		92.0	
726+40	6	? Bank D/S of W. Virginia St	4"IP		87.5	Not found.
727+00	6	W. Bank D/S of W. Virginia St	12"CMP		90.0	
739+70	6	E. Bank at SPRR	4"PVC		92.5	Not found.
741+50	7	E. Bank D/S of Hwy 87	12"CMP		94.0	
749+00	7	E. Bank D/S of Willow St	6"IP	099GAC100	101.5	
749+40	7	E. Bank at Willow St	30"CMP	099GAC110	93.0	
750+40	7	E. Bank U/S of Willow St	12"CMP		103.5	
757+40	7	E. Bank U/S of Willow St	24"[1]		97.5	
762+50	7	E. Bank D/S of Alma Ave	24"CMP	099GAC150	98.0	
763+00	7	E. Bank D/S of Alma Ave	24"CMP	099GAC160	103.0	
765+60	7	E. Bank D/S of Alma Ave	30"CMP	099GAC170	98.5	
766+00	7	E. Bank D/S of Alma Ave	20"[1]		99.5	Not found.
768+00	7	E. Bank D/S of Alma Ave	27"[1]		99.0	Not found.
772+60	7	E. Bank at Alma Ave	30"CMP	099GAC190	96.0	
772+90	7	E. Bank at Alma Ave	30"CMP	099GAC210	96.0	
795+25	9	E. Bank at Willow Glen Way	10"SP	099GAC510	111.5	
795+50	9	E. Bank at Willow Glen Way	15"CMP	099GAC520	115.5	
797+00	9	E. Bank U/S of Willow Glen Way	Two 8"IP	099GAC560 099GAC570	121.5 (both)	
797+70	9	W. Bank U/S of Willow Glen Way	10"CMP	099GAC540	117.5	
798+90	9	E. Bank U/S of Willow Glen Way	8"IP		121.0	
814+60	9	E. Bank D/S of Malone Rd	8"IP	099GAC650	126.5	
817+00	9	E. Bank D/S of Malone Rd	8"IP	099GAC670	126.5	
818+60	9	E. Bank D/S of Malone Rd	6"IP	099GAC680	127.0	
842+00	9	W. Bank D/S of Curtner Ave	2"PVC		137.0	Not found.
842+50	10A	W. Bank at Curtner Ave	8"CMP	099GAC860	123.5	
842+60	10A	W. Bank at Curtner Ave	15"[1]		125.0	Not found.

TABLE 2.7
Guadalupe River Unpermitted Outfalls
(continued)

Creek Station	Study Reach	Creek Bank and Location	Size, Type	District I.D.	Invert elev.	Comments
855+00	10A	W. Bank D/S of S. Bound Almaden Expwy	12"CMP		134.5	Not found.
859+50	10B	W. Bank U/S of S. Bound Almaden Expwy	12"CMP		141.5	
860+00	10B	E. Bank U/S of S. Bound Almaden Expwy	12"CMP		141.5	Not found.
862+00	10B	E. Bank U/S of S. Bound Almaden Expwy	18"CMP		140.0	Not found.
863+00	10B	E. Bank U/S of S. Bound Almaden Expwy	12"CMP		139.5	Not found.
869+50	10B	W. Bank D/S of N. Bound Almaden Expwy	18"CMP		138.0	
874+00	10B	W. Bank U/S of N. Bound Almaden Expwy	18"CMP		143.5	
875+50	10B	W. Bank U/S of N. Bound Almaden Expwy	18"CMP	114GAC210	144.5	
876+00	10B	W. Bank U/S of N. Bound Almaden Expwy	24"CMP	114GAC230	132.5	
878+00	10B	W. Bank U/S of N. Bound Almaden Expwy	18"CMP		133.0	
881+00	10B	E. Bank U/S of N. Bound Almaden Expwy	24"CMP	114GAC260	127.5	
901+00	10C	W. Bank D/S of Hillsdale Ave	6"IP	114GAC410	150.0	Water discharged from packing plant.
940+00	11	W. Bank D/S of Ross Creek	12"CMP	114GAC680	151.0	
940+45	11	E. Bank D/S of Ross Creek	12"RCP	114GAC690	151.5	
940+90	11	E. Bank D/S of Ross Creek	12"RCP	114GAC700	151.5	
944+90	11	E. Bank D/S of Ross Creek	18"[1]		148.5	Not found.
949+50	11	W. Bank at Ross Creek	18"CMP	114GAC800	160.0	
960+40	12	E. Bank U/S of Branham ln	12"CMP		160.0	
962+60	12	E. Bank U/S of Branham ln	8" Steel	114GAC920	169.0	
962+95	12	E. Bank U/S of Branham ln	8" Steel	114GAC940	169.0	
969+00	12	E. Bank U/S of Branham ln	Two 8"CMP	114GAC970	169.0	
970+40	12	E. Bank U/S of Branham ln	10" Steel	114GAC986	156.0	Not found.
1014+90	12	W. Bank D/S of Blossom Hill Rd	24"[1]		166.0	Under water; not found.
1015+10	12	E. Bank at Blossom Hill Rd	9"CMP	128GAC505	165.0	

[1] Unknown size or type

TABLE 2.8
Ross and Canoas Creeks Outfalls

Creek Station	Study Reach	Creek Bank and Location	Size, Type	District I.D.	Invert elev.	Comments
PERMITTED OUTFALLS						
ROSS CREEK						
4+55	-	S. Bank U/S of Almaden Expwy	12"[1]		164.0	
7+70	-	S. Bank U/S of Almaden Expwy	15"[1]		163.0	
10+10	-	S. Bank U/S of Almaden Expwy	18"[1]		158.5	
13+30	-	S. Bank U/S of Almaden Expwy	18"[1]		163.0	
18+10	-	N. Bank D/S of Cherry Ave	12"[1]		160.0	
18+35	-	S. Bank D/S of Cherry Ave	36"[1]		158.5	Permit # 74312
20+85	-	S. Bank D/S of Cherry Ave	24"[1]		158.5	
24+35	-	S. Bank D/S of Cherry Ave	12"[1]		160.5	
28+95	-	S. Bank @ Cherry Ave	18"[1]		162.5	
31+95	-	S. Bank U/S of Cherry Ave	24"[1]		163.0	
34+40	-	N. Bank U/S of Cherry Ave	12"[1]		165.0	
43+45	-	S. Bank D/S of Jarvis Ave	42"[1]		165.5	
43+45	-	S. Bank D/S of Jarvis Ave	18"[1]		171.0	Permit # 68336
CANOAS CREEK						
3+05	-	N. Bank U/S of N. Bound Almaden Expwy	12"[1]		134.5	
UNPERMITTED OUTFALLS						
ROSS CREEK						
26+40	-	S. Bank D/S of Cherry Ave	12"CMP		167.5	Not shown on city plans.
CANOAS CREEK						
		No Unpermitted outfalls for Canoas Creek.				

[1] Unknown size or type

The largest recorded flow on the Guadalupe River occurred on April 2, 1958. Floodwaters overbanked in downtown San Jose covering a two block area to depths of up to 4 feet. Waters also spilled downstream, flooding about 2,700 acres of agricultural land and inundating the Town of Alviso for 17 days. On April 8, 1958, the San Jose News described the flooding:

> "The river was San Jose's chief troublemaker last week, dumping water on considerable private property, homes, and city streets."

The April 1958 flood discharge was nearly twice the discharge recorded for the December 1955 storm while the 1955 precipitation was much greater. This was due to the upstream water conservation reservoirs which were nearly empty before the 1955 storm but were full before the 1958 storm.

Flooding Problem in Guadalupe River

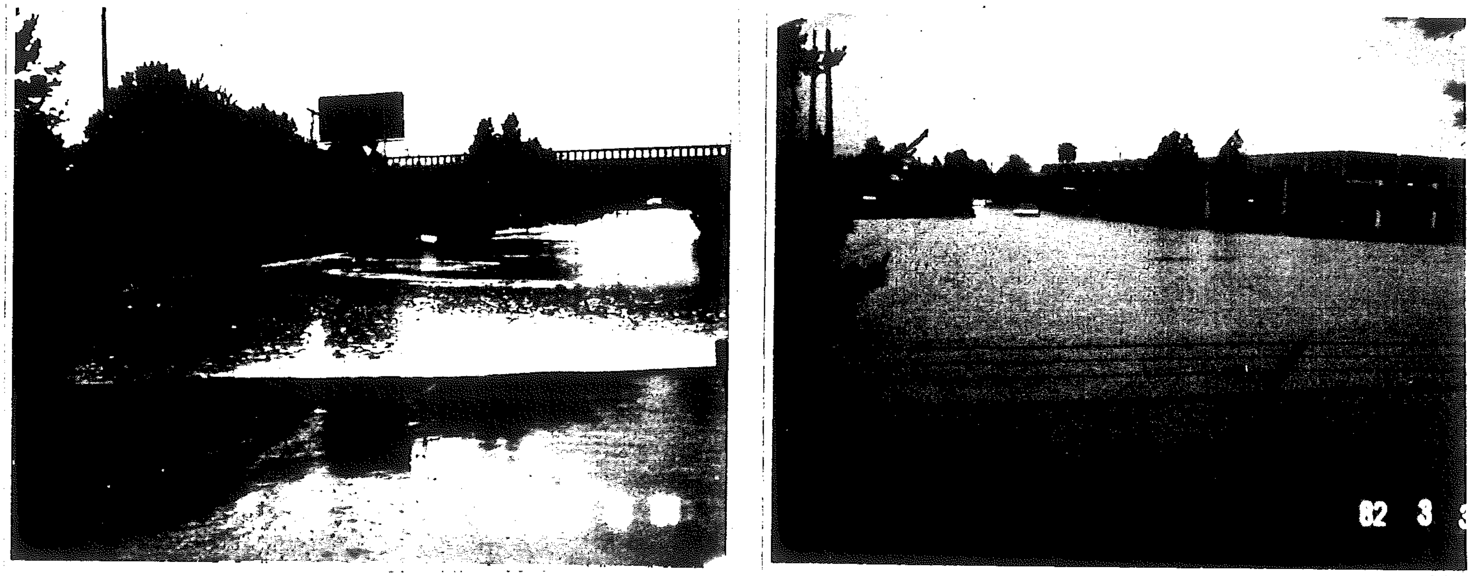
The Guadalupe River flooded San Jose communities recently during the winters of 1980, 1982, 1983, 1986, and 1995. Flood peak flow rates are summarized in Table 2.9.

In February of 1980, flooding occurred along the Guadalupe River. During that storm, floodwaters overbanked the east levee upstream of Alma Avenue and caused flooding up to 1-foot deep in the Elks Lodge parking lot. The river flowed near bank full through many areas, causing problems for local storm drainage systems. Flood damages consisted of bank erosion, debris accumulation, and sediment deposition. Cost of repairs were estimated at $100,000. The peak flow rate recorded for the February 19, 1980, flood was 2,970 cfs upstream of Almaden Expressway.

Flooding occurred again along the Guadalupe River in 1982. On March 31, 1982, the river overbanked the east levee between Alma Avenue and the Union Pacific Railroad (UPRR), flooding about 60 acres from UPRR to West Virginia Street (see Figure 2.10). The Elks Lodge on Alma Avenue flooded to a depth of about 1-foot. The Willow Street and Alma Avenue undercrossings of SPRR flooded up to 10 feet in depth. Twenty homes and five businesses were damaged by floodwaters. Residents were evacuated from their homes on McLellan Avenue and several roads were closed to traffic in the area. Damages were estimated at $410,000.

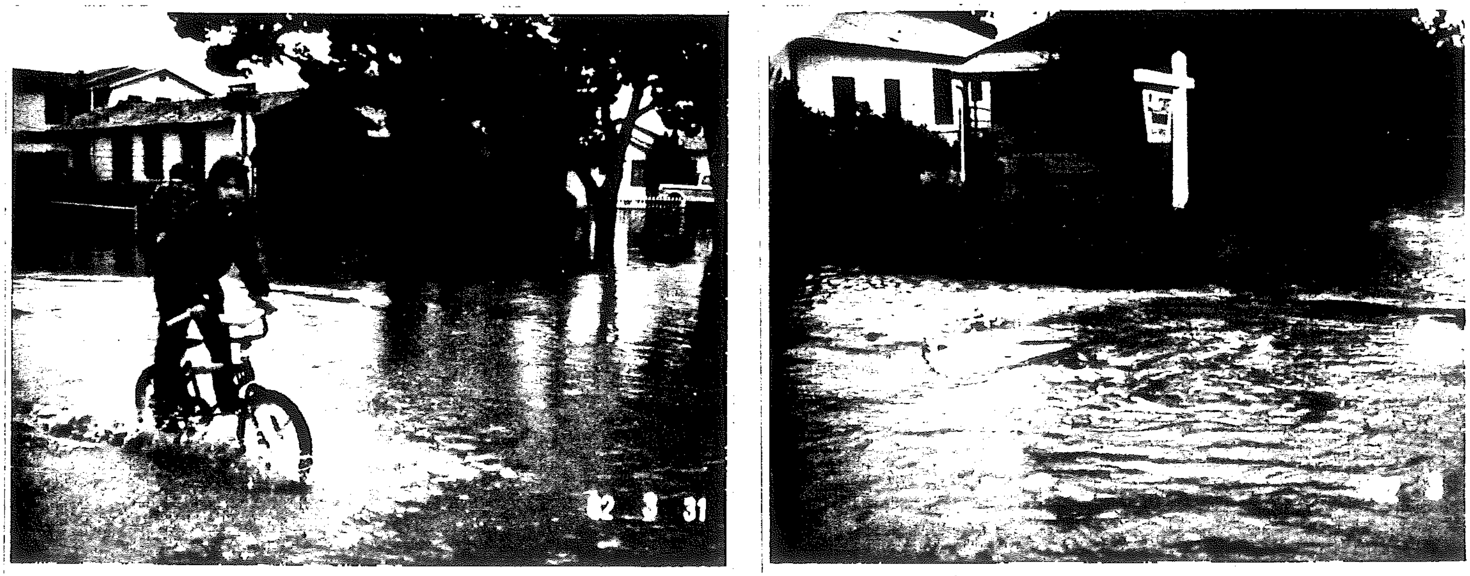
After the January 1983 flooding in Santa Clara County, the Governor of California issued a State of Emergency Declaration and the President of the United States issued a Declaration of a Major Disaster for Public Assistance. The Guadalupe River flooded between UPRR and West Virginia Street during January 1983 inundating about 60 acres (see Figure 2.11).

FIGURE 2.10
Guadalupe River Flooding—March 31, 1982



Reach 7: Flooding on Willow Street at SPRR Overpass

Reach 7: Flooding at the Elk's Lodge



Reach 6: Flooding on Harliss Avenue

Reach 6: Flooding on McLellan Avenue

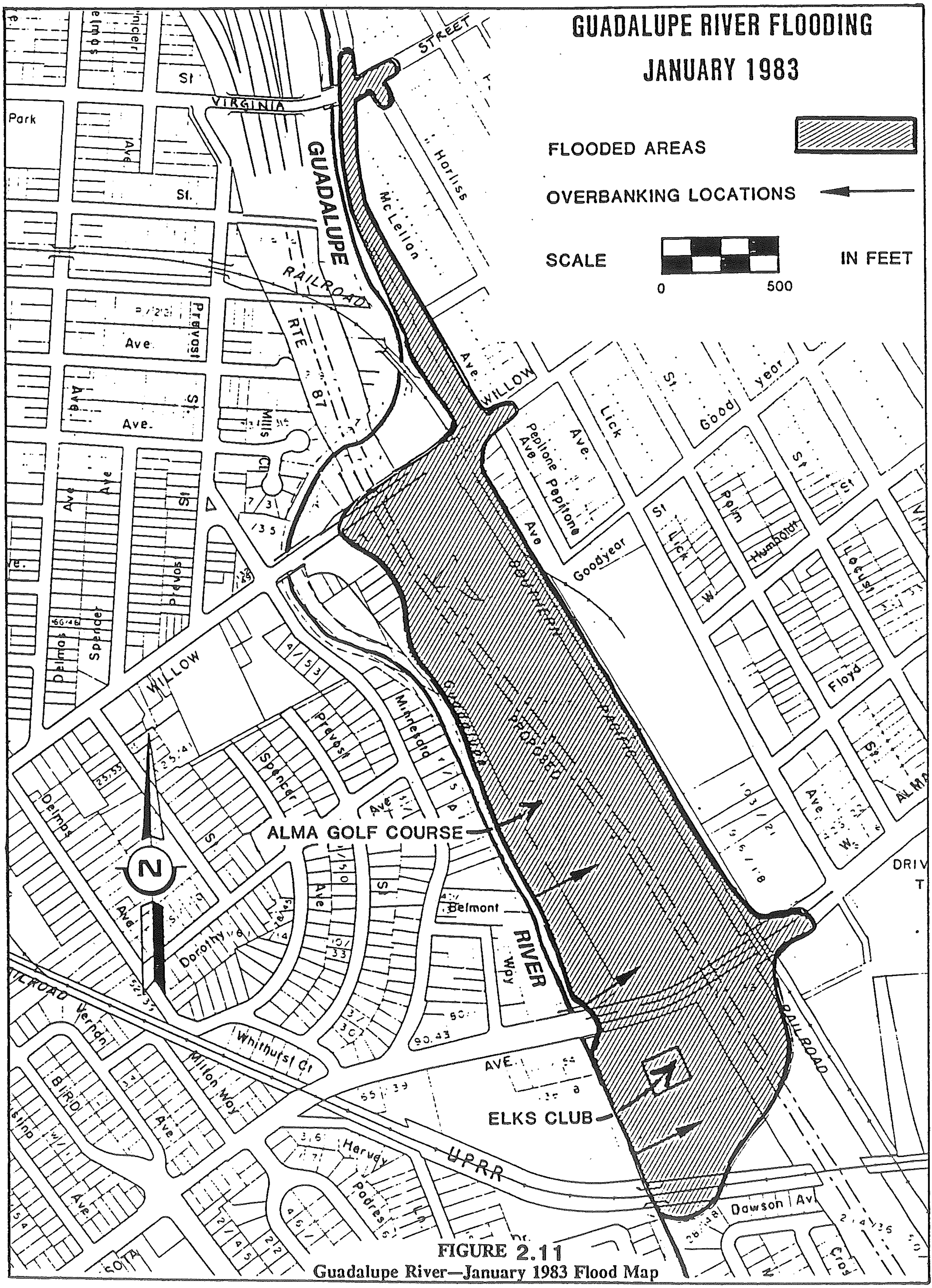


FIGURE 2.11
Guadalupe River—January 1983 Flood Map

TABLE 2.9
Guadalupe River—Flood Peak Discharges

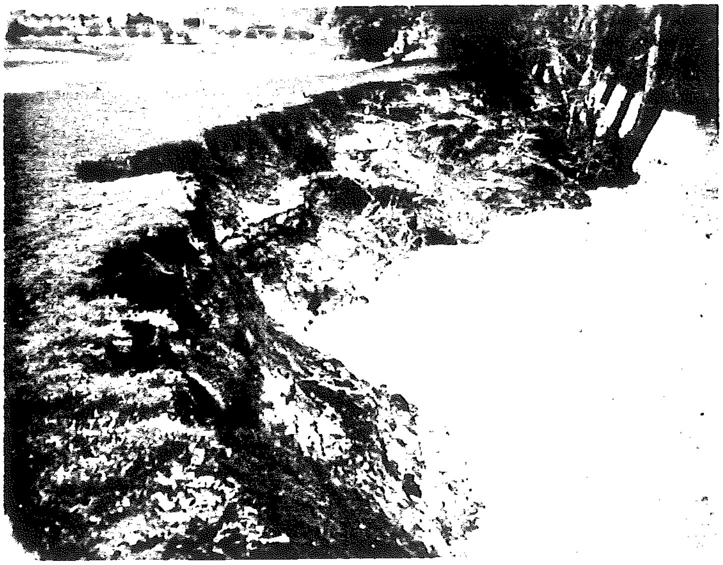
Date	Discharge (cfs) United States Geological Survey Gage Downstream of Los Gatos Creek	Frequency (year)	Discharge (cfs) District Gage at Almaden Expressway	Frequency (year)
February 27, 1940	8,680	18	630	1
February 2, 1945	6,600	10	2,460	4
January 12, 1952	8,000	14	2,550	4
April 2, 1958	9,150	20	6,220	21
February 19, 1980	7,910	13	2,970	5
March 31, 1982	7,340	12	3,790	7
January 24, 1983	7,130	12	4,930	12
February 18, 1986	9,140	20	4,310	9
January 9, 1995	9,000	19	8,470	36
March 10, 1995	10,500	29	5,590	15

Floodwaters overbanked the east levee upstream of Alma Avenue and both the east and west levees downstream of Alma Avenue. The high flows also caused local drainage problems and severe erosion damage to the Guadalupe River (see Figure 2.12).

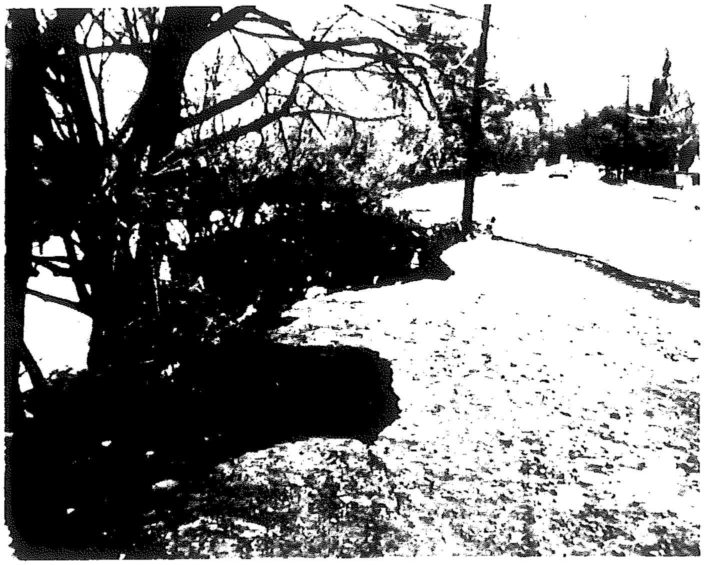
On January 9, 1995, Guadalupe River spilled over its banks at three locations in central San Jose, along River Street; at Virginia Street, where water flowed onto Highway 87; and near Alma Avenue (see Figure 2.13). The water raged beneath the St. John Street bridge in downtown San Jose at 8,950 cubic feet per second.

On the night of January 9 from Virginia Street to Alma Avenue in the Gardener district, which is along Highway 87 and the Guadalupe River, the water in the Guadalupe River reached depths of 15 feet. The river overbanked the easterly levee between Alma Street and the Union Pacific Railroad bridge in San Jose, flooding the Elks' Lodge property and Alma Street. On Belmont Way in San Jose firefighters used at least one raft to help evacuate residents while others swam out. Red Cross shelters were prepared at three San Jose high schools and the City of San Jose set up five locations to distribute sandbags.

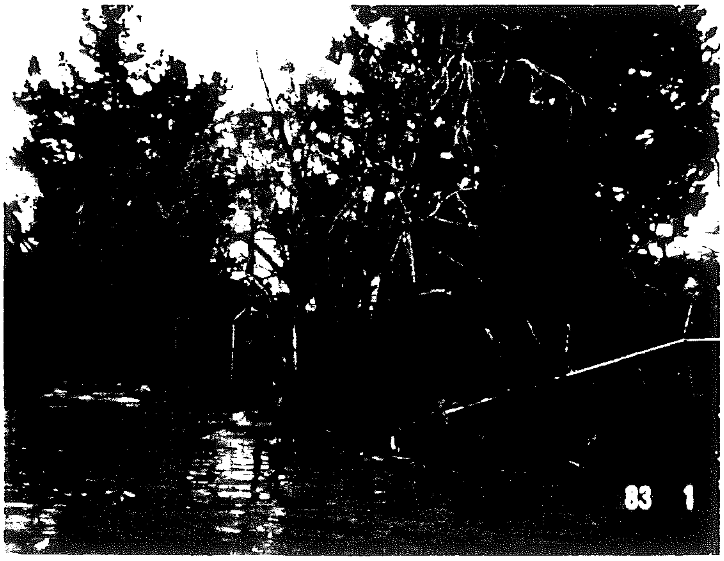
FIGURE 2.12
Guadalupe River Erosion Damage - January 27, 1983



Reach 7: Erosion on the East Bank
South of Willow Street



Reach 6: Erosion on the East Bank
North of Virginia Street



Reach 7: Erosion on the East Bank
Levee at the Elk's Lodge

Reach 7: Erosion on the West Bank
South of Alma Street

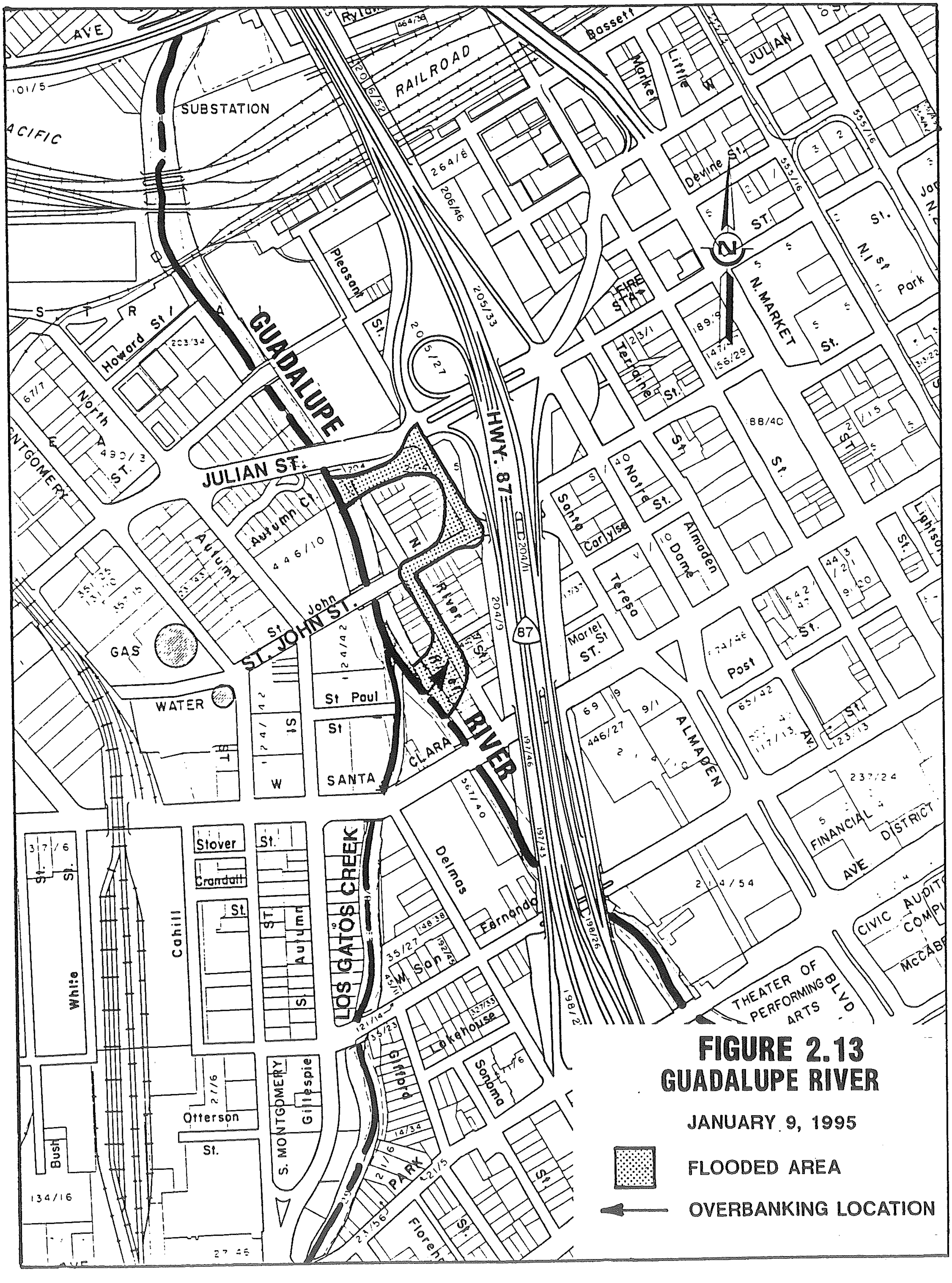


FIGURE 2.13
GUADALUPE RIVER

JANUARY 9, 1995

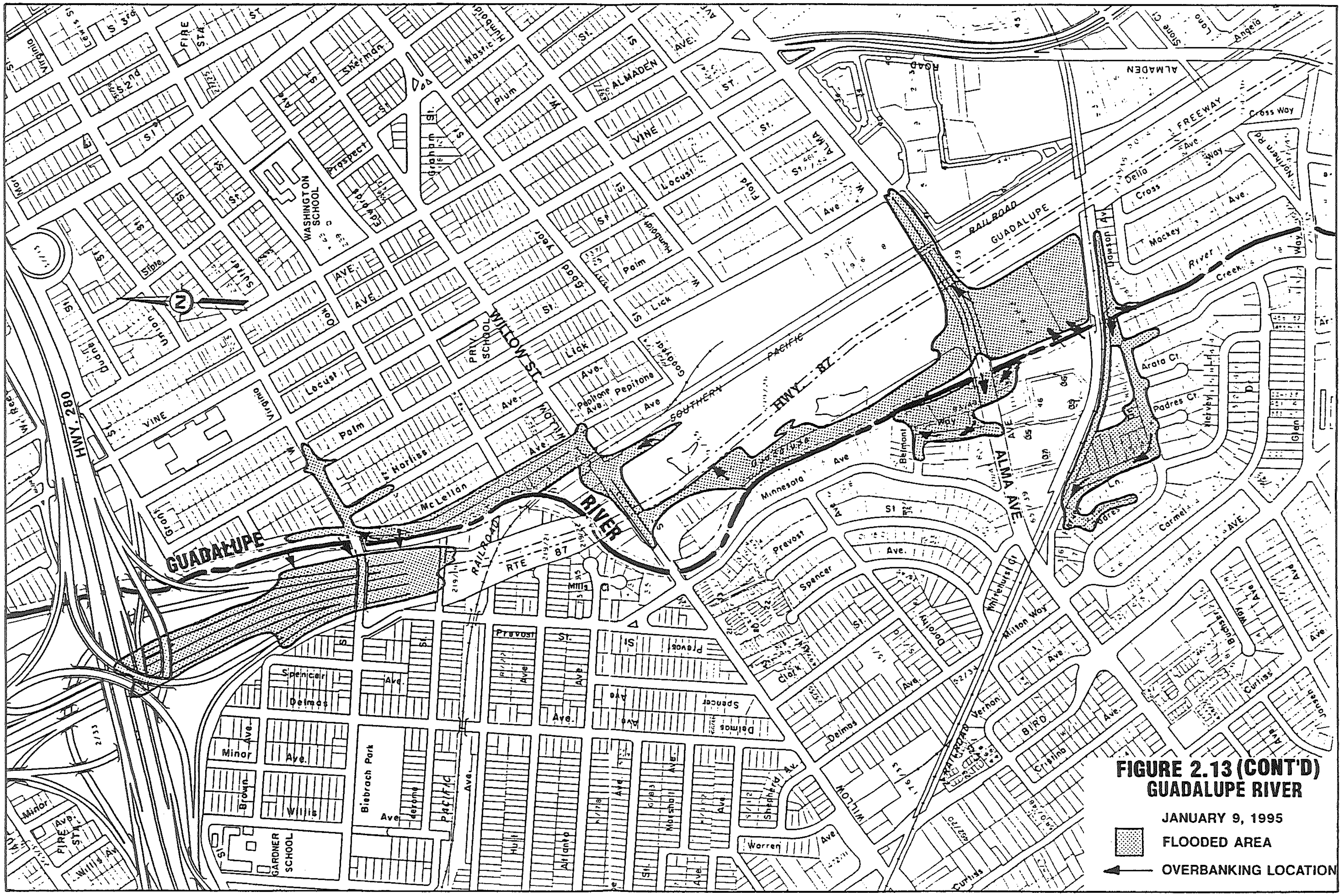


FIGURE 2.13 (CONT'D)
GUADALUPE RIVER

JANUARY 9, 1995

The river also spilled over its banks south of Interstate 280 and forced its way into homes and pushed cars 50 feet along sidewalks. Highway 87 was under 6 feet of water from the northbound connector with Interstate 280 to south of the Virginia Street overpass closing the highway and disrupting travel for thousands of commuters. Water overtopped the riverbanks, seeped through the embankments and cascaded on to Highway 87. The light rail tracks were also submerged in the median of highway. Sandbags were placed along the banks of the nearby Guadalupe River and emergency stabilization measures were required to protect the highway embankment from erosion. The cleanup cost was estimated to be $100,000. The southbound lanes of Highway 87 were finally opened for the afternoon commute of January 11 and the northbound lanes were opened the morning of January 12.

Flooding occured again along the Guadalupe River on March 10, 1995 (see Figure 2.14). The Guadalupe River carried more water through downtown San Jose than any previous flood of record. Guadalupe River spilled upstream of Virginia Street and upstream of Jerome Street flooding Highway 87 (see Figure 2.15). Homes along Virgina Street and St. John Street were evacuated due to flooding. The Elk's Lodge on Alma Avenue was also flooded (see Figure 2.16). The Willow Street and Alma Avenue crossings of Highway 87 flooded up to 10 feet in depth (see Figure 2.17). Floodwaters followed the existing topography downstream flooding Willow Street and properties on McLellan Avenue and Harliss Avenue. Properties on Belmont Way were also flooded (see Figure 2.18) .

Homes and businesses along River Street were flooded for the second time since January. Hotels and new offices needed sandbags to prevent floodwaters from entering the buildings. Downtown museums, the county government building and the courts all closed to evacuate workers when the surrounding streets flooded. Water continued up San Pedro Street to Hedding threatening many older homes and depositing mud and silt everywhere. The water flowed east to Sixth Street, entering many buildings in the commercial area, and disrupting traffic and businesses. First Street was deep in water from south of Taylor Street to Hedding Street.

Flooding Problem in Los Gatos Creek

In March 1911, floodwaters rushed towards the town of Campbell. The railroad tracks from Campbell Avenue to near one bridge were underwater. In February 1940, high waters caused another flood, threatening railroad tracks and bridges, as well as demolishing one dam. During the December 1955 flooding, the major damage occurred along roads, bridges, culverts and other public facilities due to rapid runoff from the mountains. No agricultural damages were reported, and damage to commercial and residential buildings was minor. However, approximately 190 acres were flooded between Vasona Reservoir and Lexington Reservoir. Total damage costs that resulted from the 1955 flooding was $175,200 (1955 dollars). During the February 1986 flooding, "Los Gatos Creek overflowed its banks downstream of Lark Avenue for approximately 1,800 feet. Water was confined within Charter Oaks Drive and Oka Road but never went over the street curbs. A few mobile homes in this area were reportedly damaged by the flooding." (See Figure 2.19.)

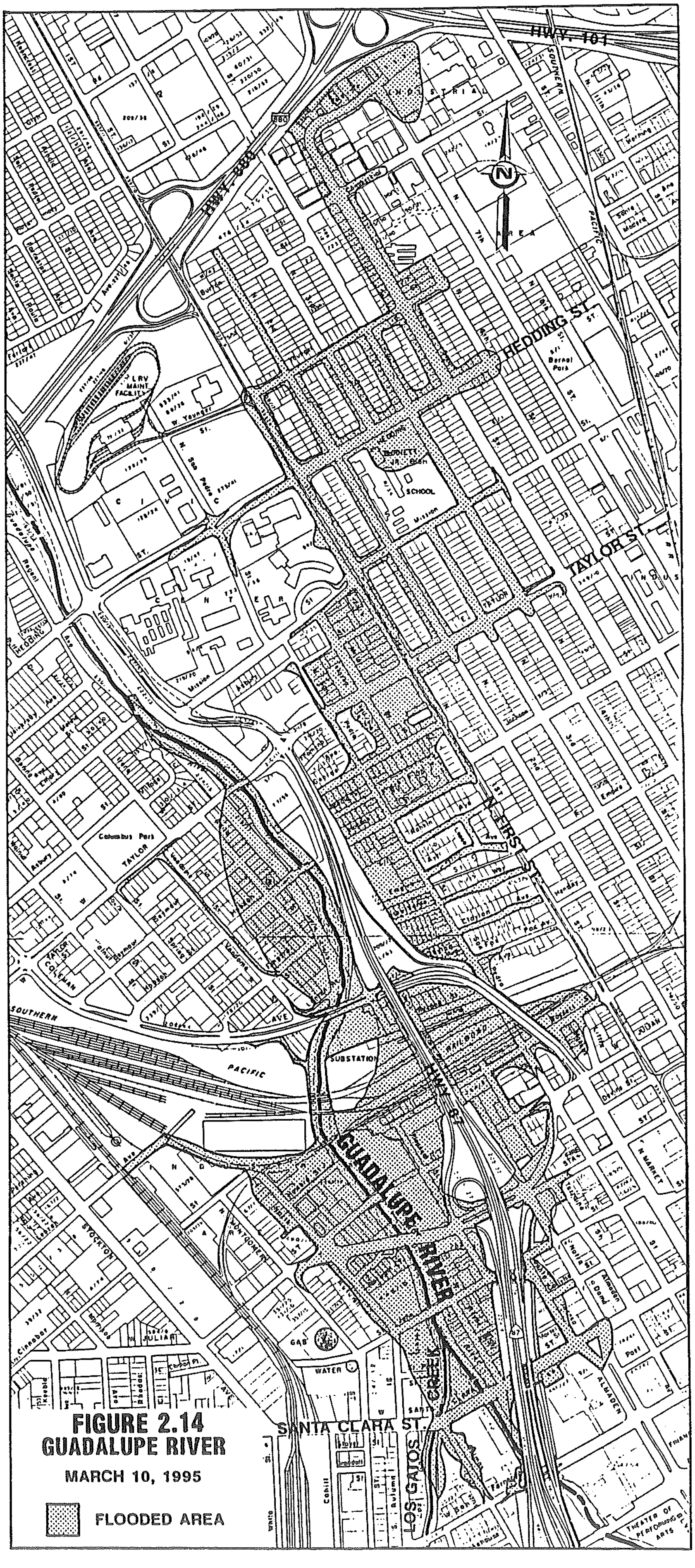


FIGURE 2.14
GUADALUPE RIVER
MARCH 10, 1995

▨ FLOODED AREA

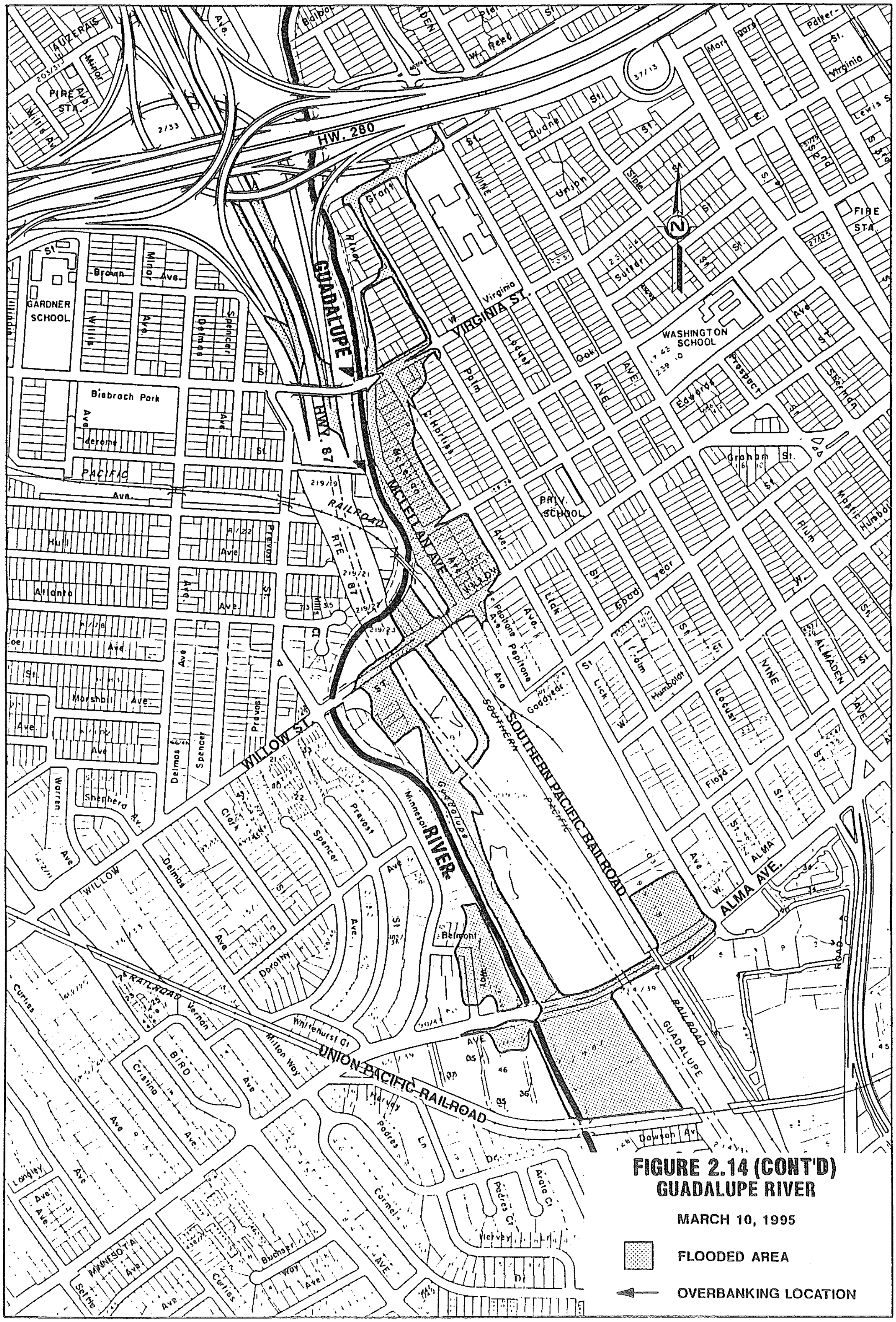


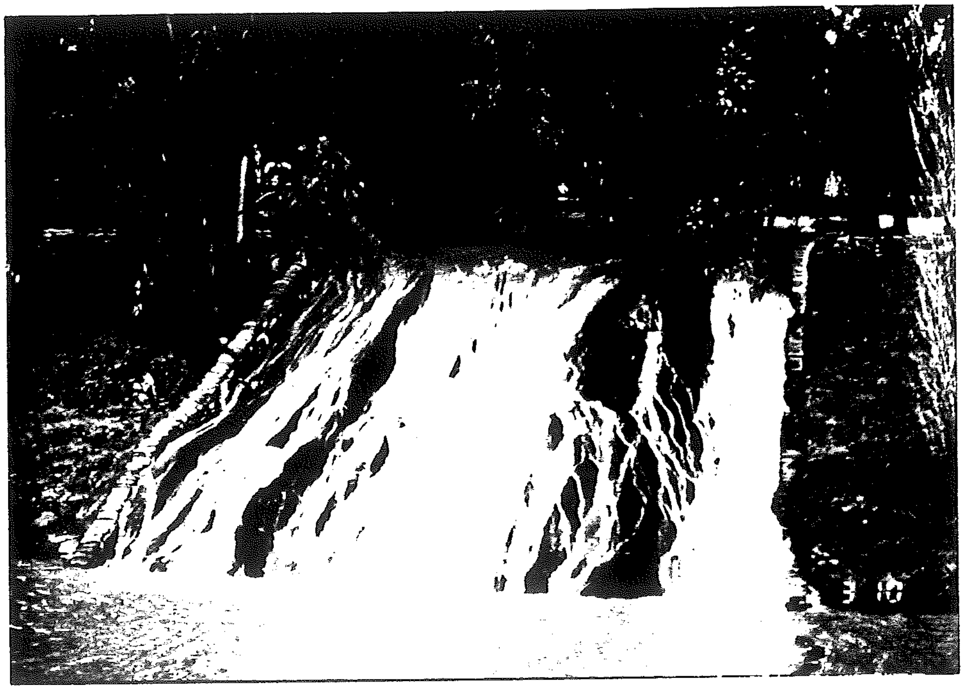
FIGURE 2.14 (CONT'D)
GUADALUPE RIVER

MARCH 10, 1995

▨ FLOODED AREA

← OVERBANKING LOCATION

Flooding Over West Bank of Guadalupe River Into Highway 87



Looking North From West Bank of Guadalupe River at Highway 87 Flooding

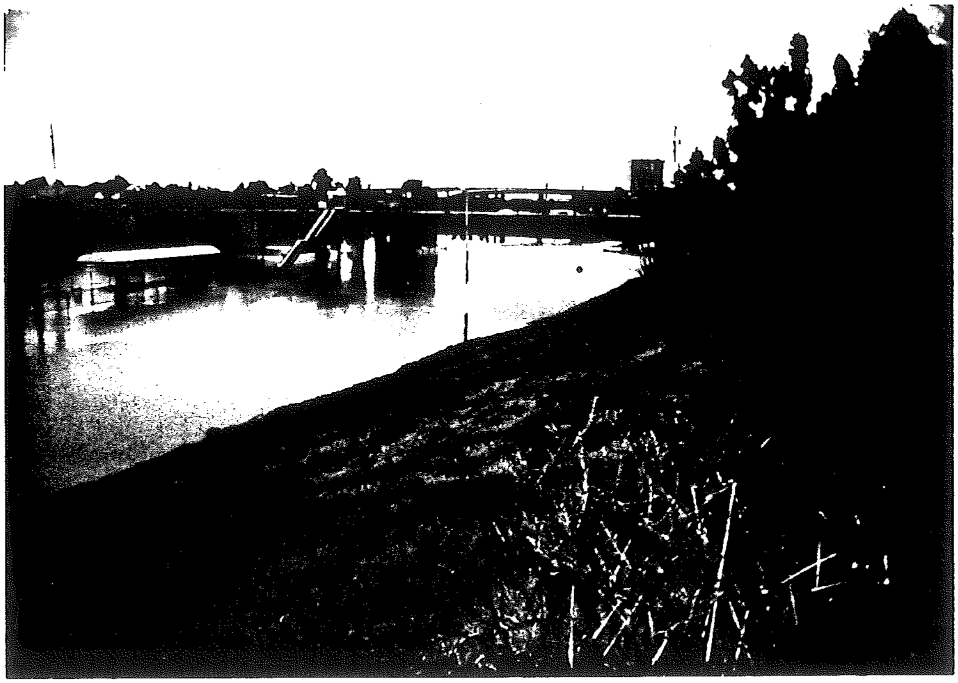
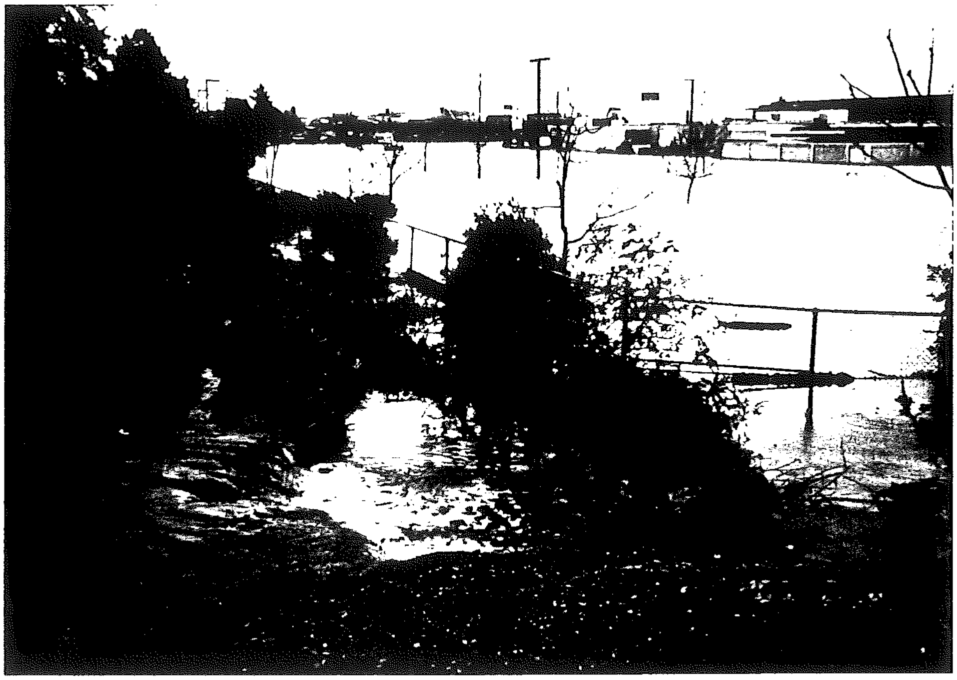


FIGURE 2.15: GUADALUPE RIVER FLOODING - MARCH 10, 1995

Looking North at Elk's Lodge Flooding From UPRR Tracks



Looking South at Elk's Lodge Flooding From Corner of Alma and Lelong

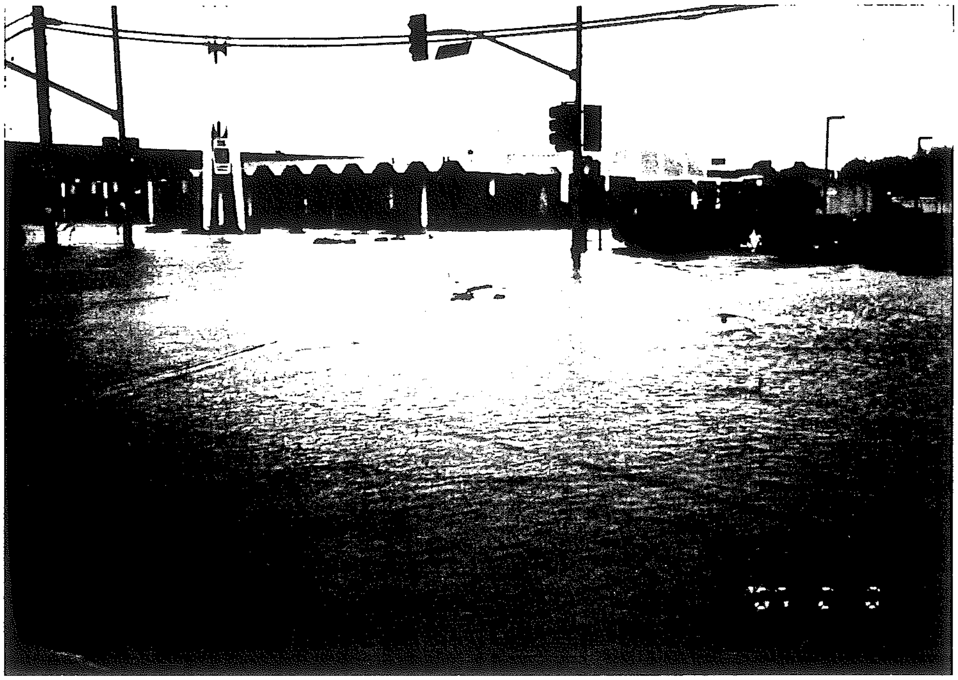
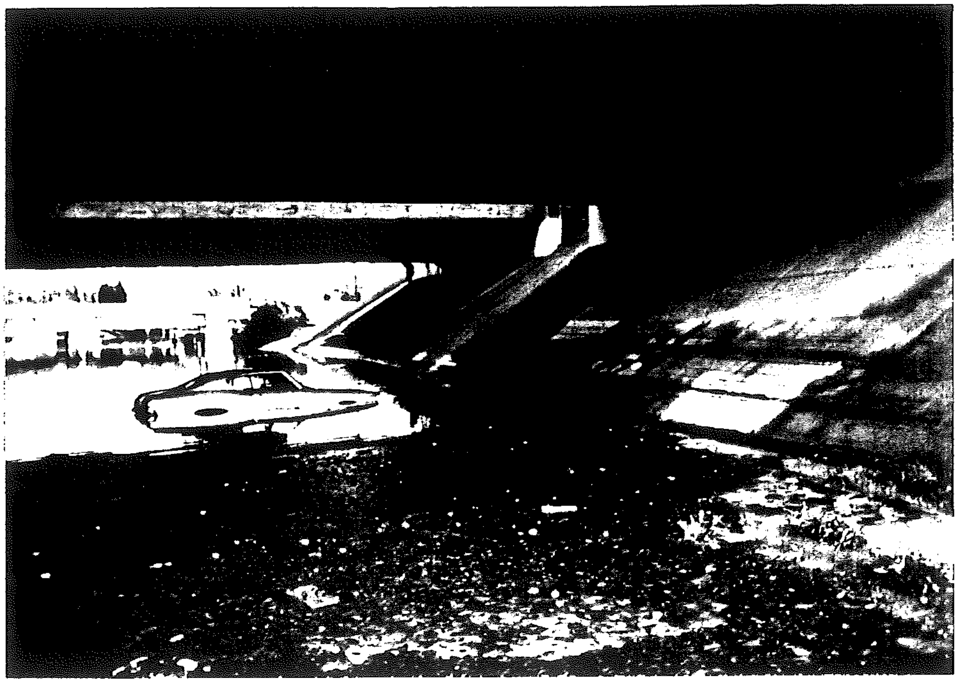


FIGURE 2.16: GUADALUPE RIVER FLOODING - MARCH 10, 1995

Alma Avenue's Highway 87 and SPRR Underpass



Willow Street's Highway 87 and SPRR Underpass

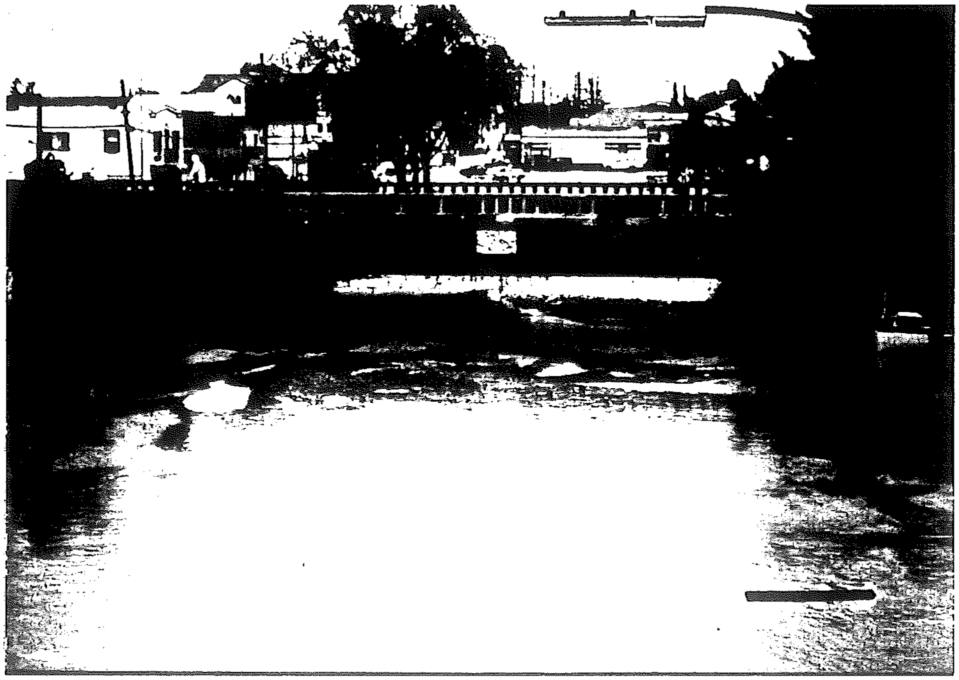
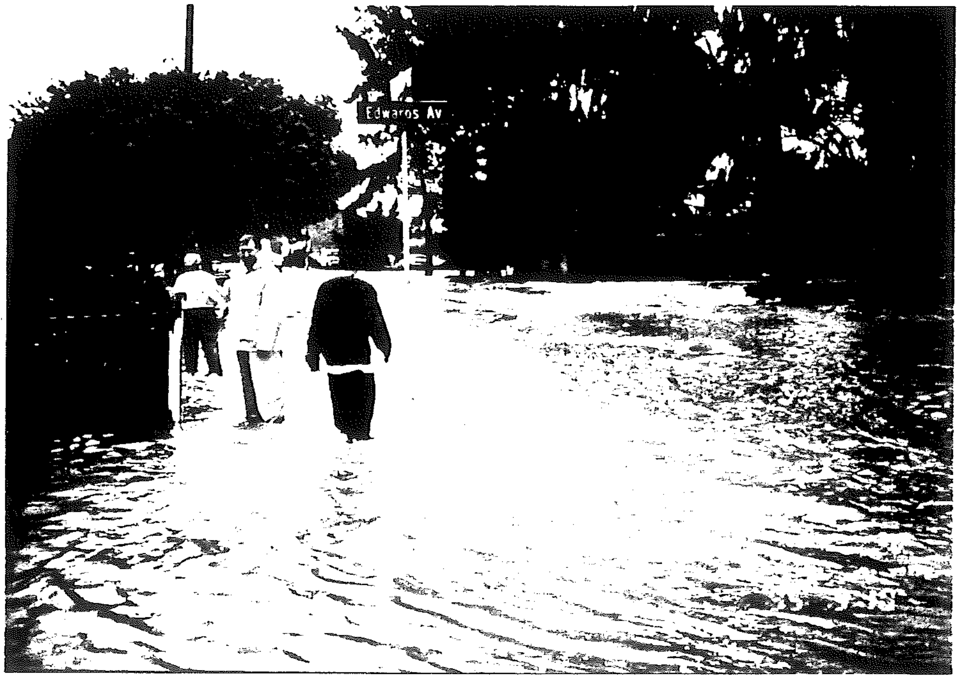


FIGURE 2.17: GUADALUPE RIVER FLOODING - MARCH 10, 1995

Street Flooding - Corner of McClellan and Edwards



Street Flooding Along Belmont Way (Note Highwater Line)

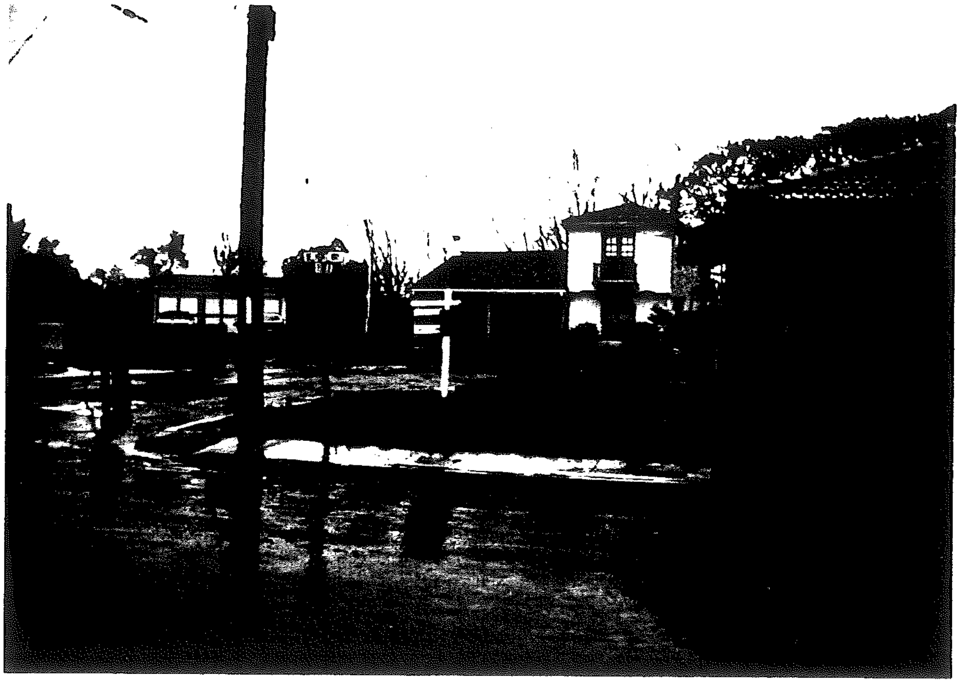
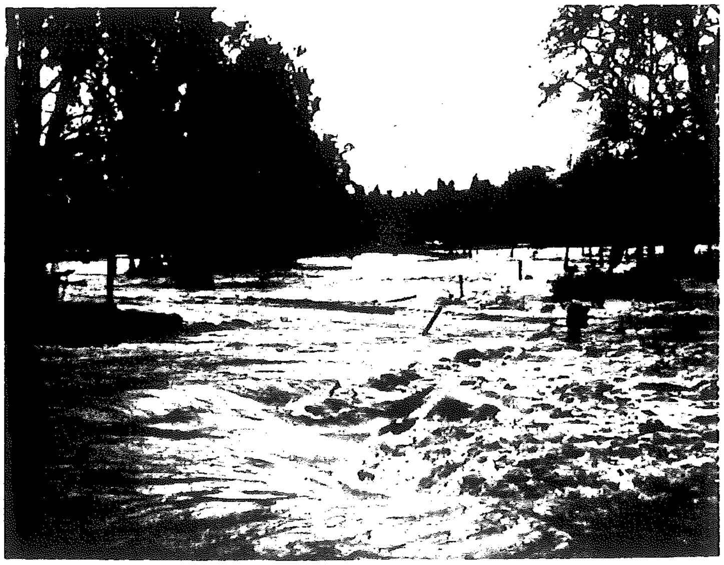


FIGURE 2.18: GUADALUPE RIVER FLOODING - MARCH 10,1995

FIGURE 2.19
Los Gatos Flooding in Guadalupe River Watershed
FEBRUARY 19, 1986



Los Gatos Creek: Flooding at Vasona Park

Los Gatos Creek: Flooding at Vasona Park

Los Gatos Creek: Flooding at Lark Avenue

Los Gatos Creek: Flooding at Lark Avenue

Flooding Problem in Canoas Creek

In March 1911, Canoas Creek, along with Los Gatos and Almaden Creeks, overflowed causing flooding along the streets and around the homes of the city. San Jose appeared like an island.

In January 1982, floodwaters overflowed in Canoas Creek and caused minor flooding at Tillamook Drive (see Figure 2.20).

On the night of January 9, 1995, Canoas Creek spilled over its banks at four locations: Redbird Drive, Kingfisher Drive, Calero Avenue, and Blossom Avenue (see Figures 2.21 and 2.22) and flooded a few homes along Nightingale Drive.

Flooding Problem in Ross Creek

In February 1980, a 10-year storm event (1,600 cfs at Cherry Avenue) occurred on Ross Creek. A backwater condition created by the Guadalupe River caused overbanking at Cherry Avenue, Jarvis Road and Kirk Road. The most pronounced overbanking occurred at the Jarvis Road box culvert. Water rose to a foot above the bank elevation at the culvert and extended approximately 500 feet upstream to Reed School. Homes located at the north bank just upstream of the box culvert experienced the worst flooding. Based upon high watermarks and overflow patterns obtained from field inspection, the estimated total peak overbank flow at Jarvis Road was approximately 500 cfs with 300 cfs overbanking to the north and 200 cfs overbanking to the south. Floodwaters covered nearly five blocks along Cherry Avenue and the entire length of Montmorency Drive. Approximately 60 homes were threatened. The depth of flooding at the east end of Montmorency Drive was over two feet and on the verge of entering some of the homes. Minor overbanking occurred at the Kirk Road box culvert. Flooding also occurred at Twin Oaks Drive and Kennedy Road. Total damages amounted to approximately $15,000 (see Figure 2.23).

During the February 1982 storm, there was extensive erosion damage on Ross Creek, but there was no flooding reported.

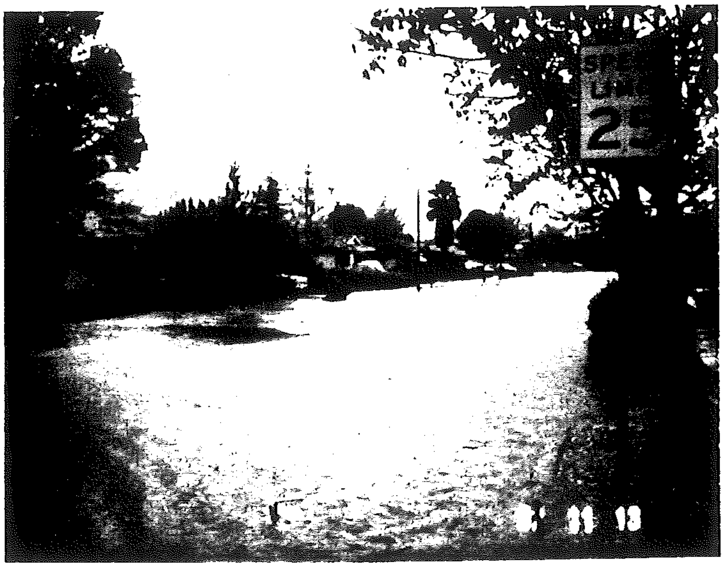
In February 1986, floodwaters caused overbanking upstream of Cherry Avenue and Jarvis Avenue with minor street flooding.

On the night of January 9, 1995, Ross Creek spilled over its banks at Cherry Avenue along Montmorency Drive and at Jarvis Avenue in San Jose (see Figures 2.24 and 2.25). Water has entered some of the homes on the north bank.

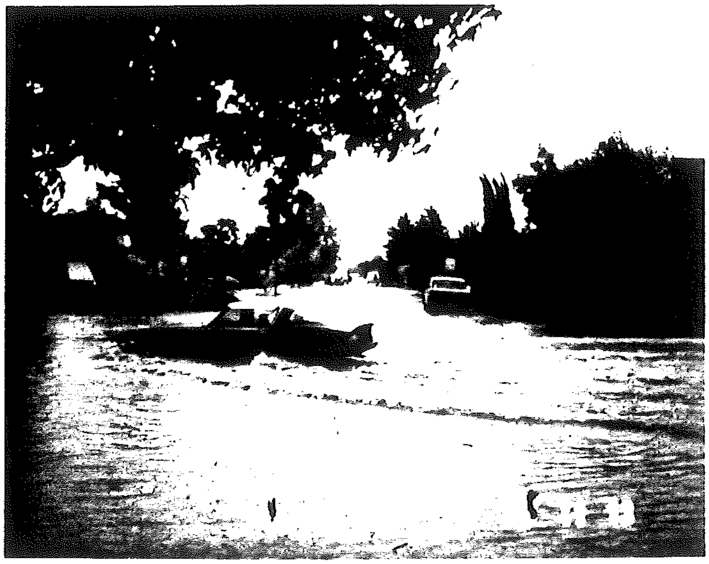
Flooding Problem in Guadalupe Creek

In February 1986, floodwaters overtopped the west bank downstream of the intersection of Hicks and Shannon Roads. However, the water crested over the low point of the west bank and immediately flowed back to the creek causing no significant damage.

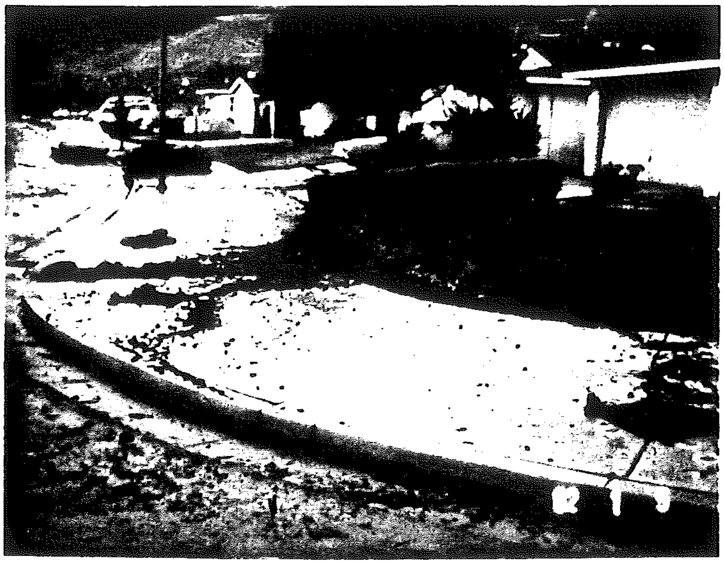
FIGURE 2.20
Canoas Creek Flooding in the Guadalupe River Watershed
November 11, 1981 And January 5, 1982



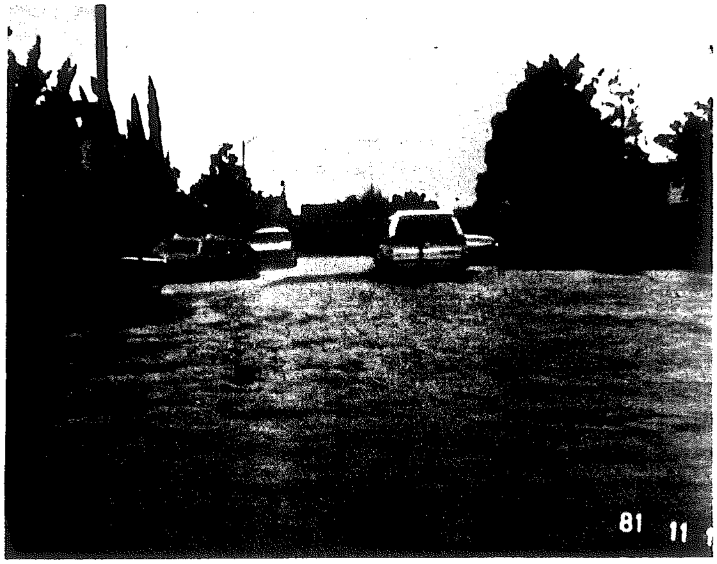
Canoas Creek: Flooding on Snell Avenue
at Cree Drive



Canoas Creek: Flooding on Snell Avenue
at Suisse Drive



Canoas Creek: High Water Mark on Cree Drive
at Sager Way



Canoas Creek: Flooding on Blossom Avenue
at Lean Avenue

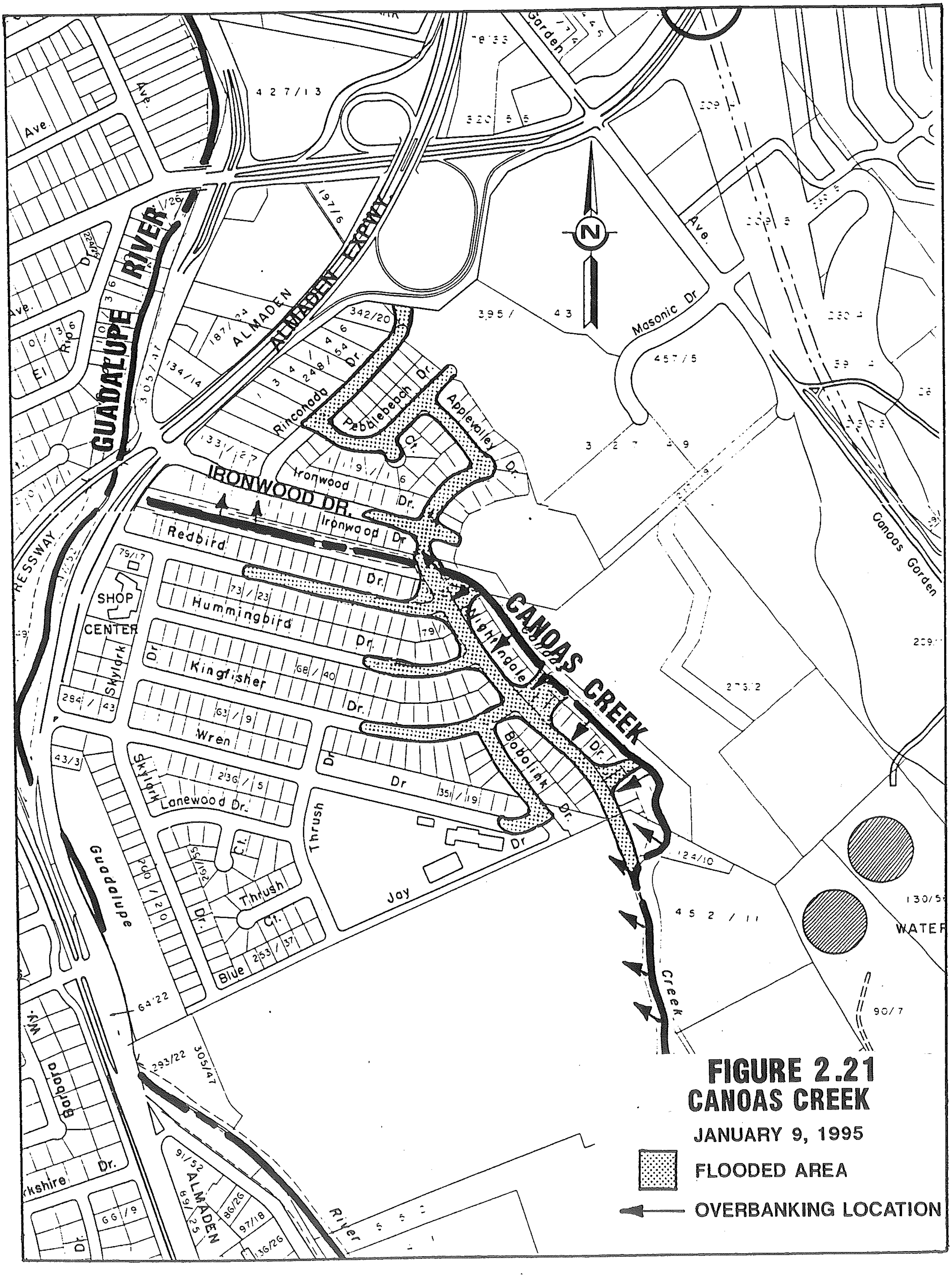


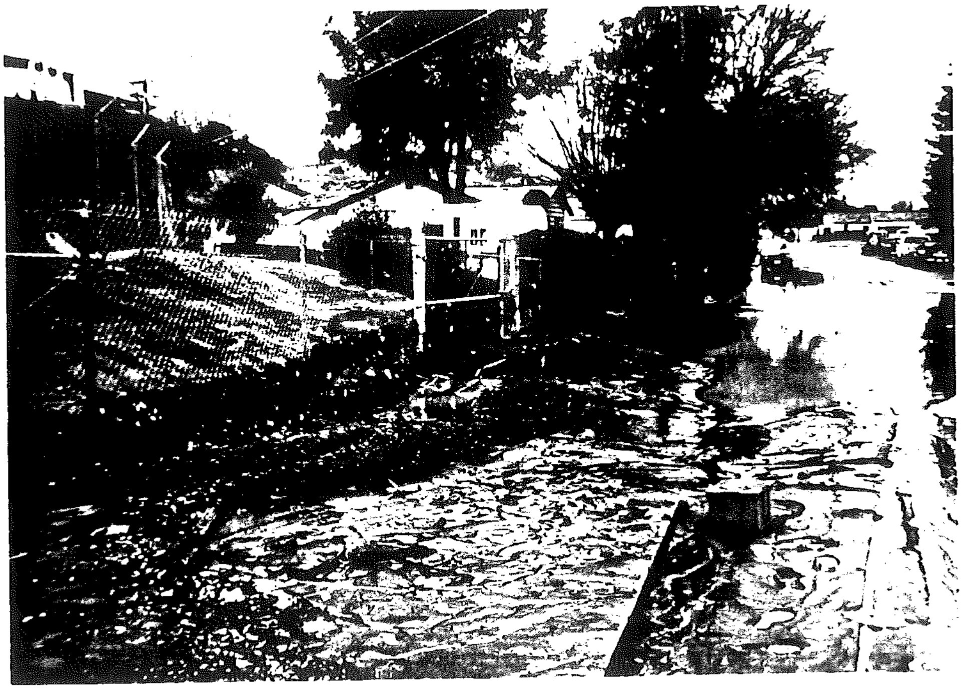
FIGURE 2.21 CANOAS CREEK

JANUARY 9, 1995

▨ FLOODED AREA

← OVERBANKING LOCATION

Looking South Along Nightingale Drive



Looking South at Corner of Nightingale Drive and Redbird Drive

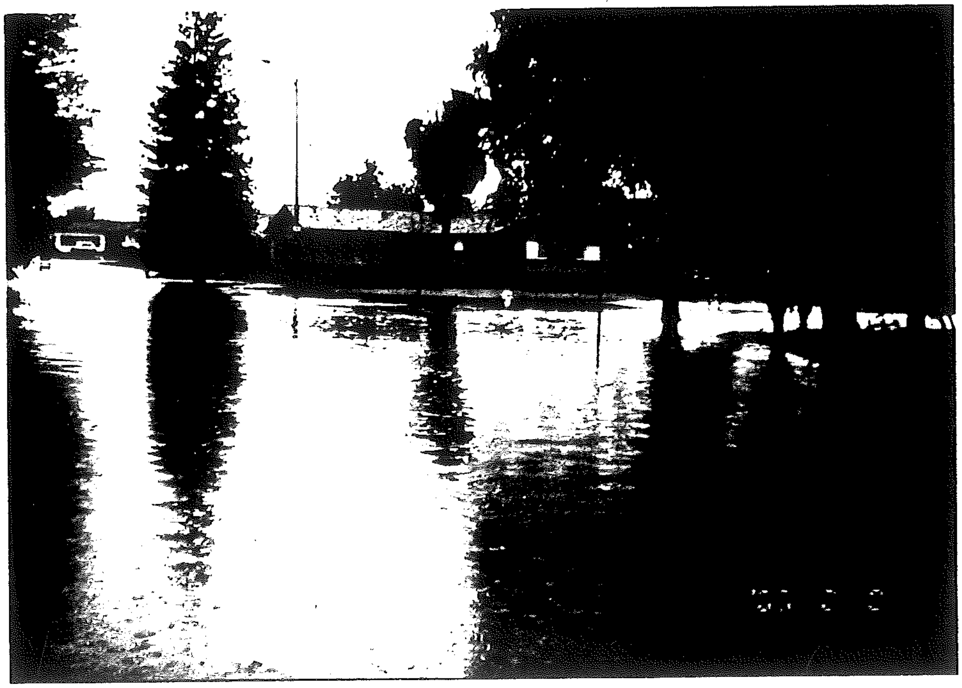
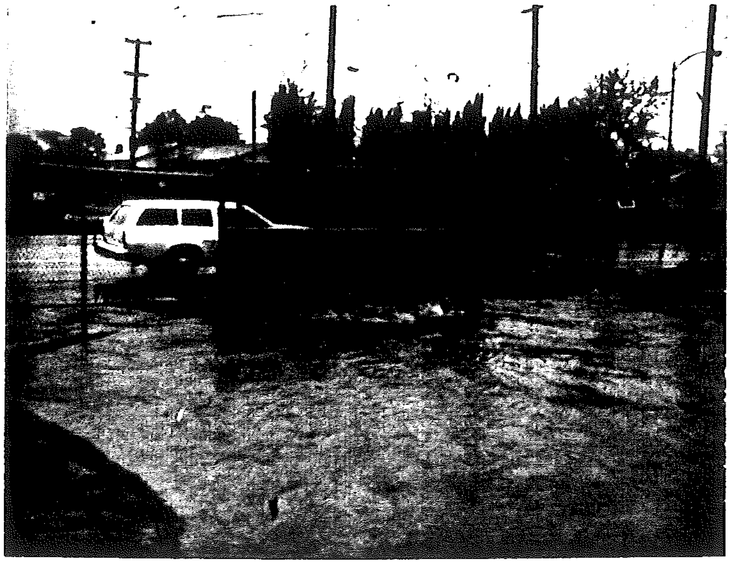
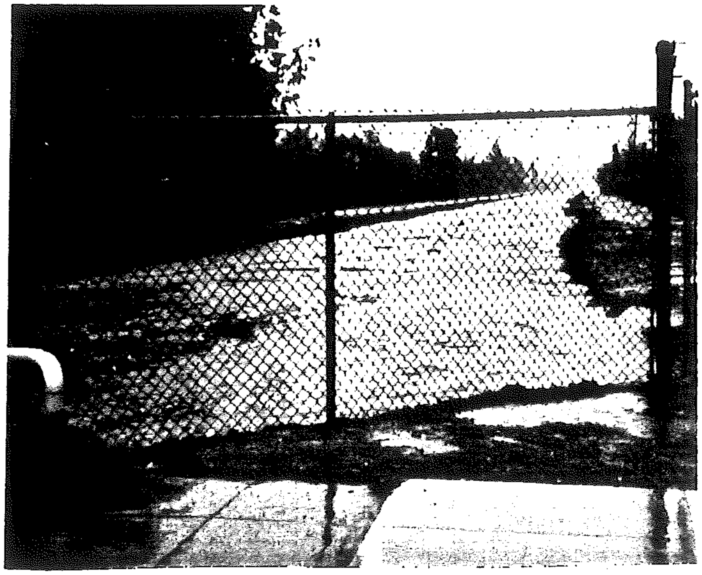


FIGURE 2.22
CANOAS CREEK FLOODING IN GUADALUPE RIVER WATERSHED
MARCH 10, 1995

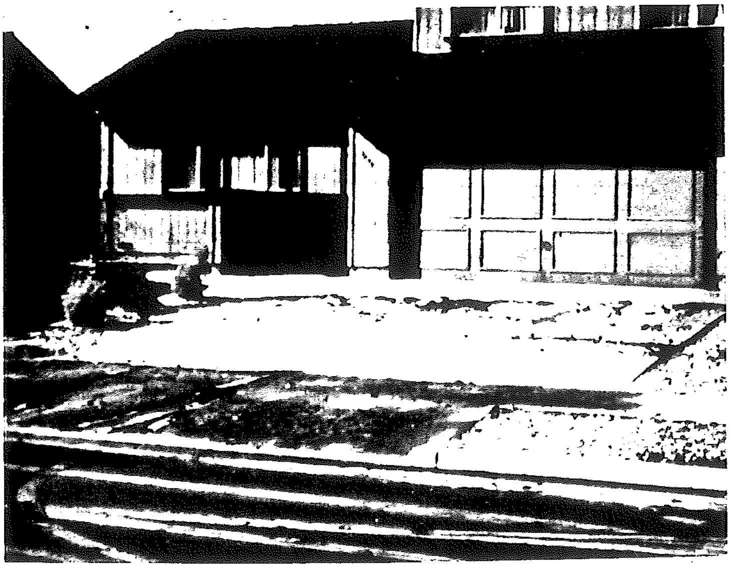
FIGURE 2.23
Ross Creek Flooding in the Guadalupe River Watershed - January, 1980



Ross Creek: High Water at Cherry Avenue

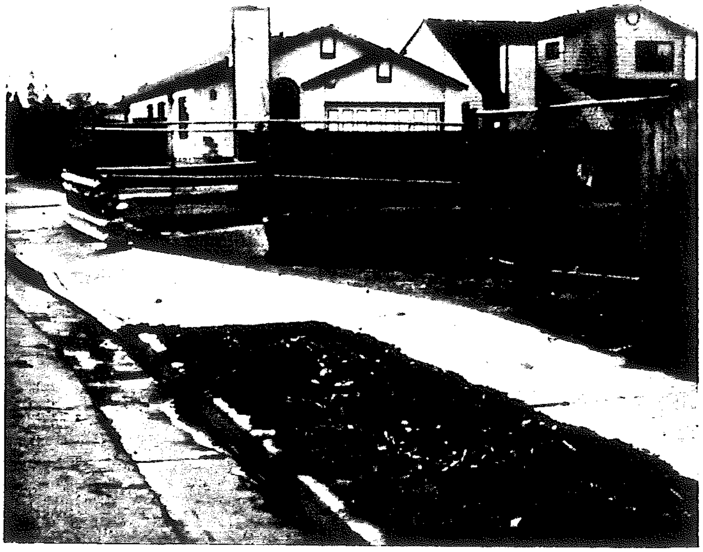


Ross Creek: High Water at Jarvis Avenue



Ross Creek: High Water Mark at Montgomery Drive

Montmorency



Ross Creek: High Water Mark at Jarvis Avenue

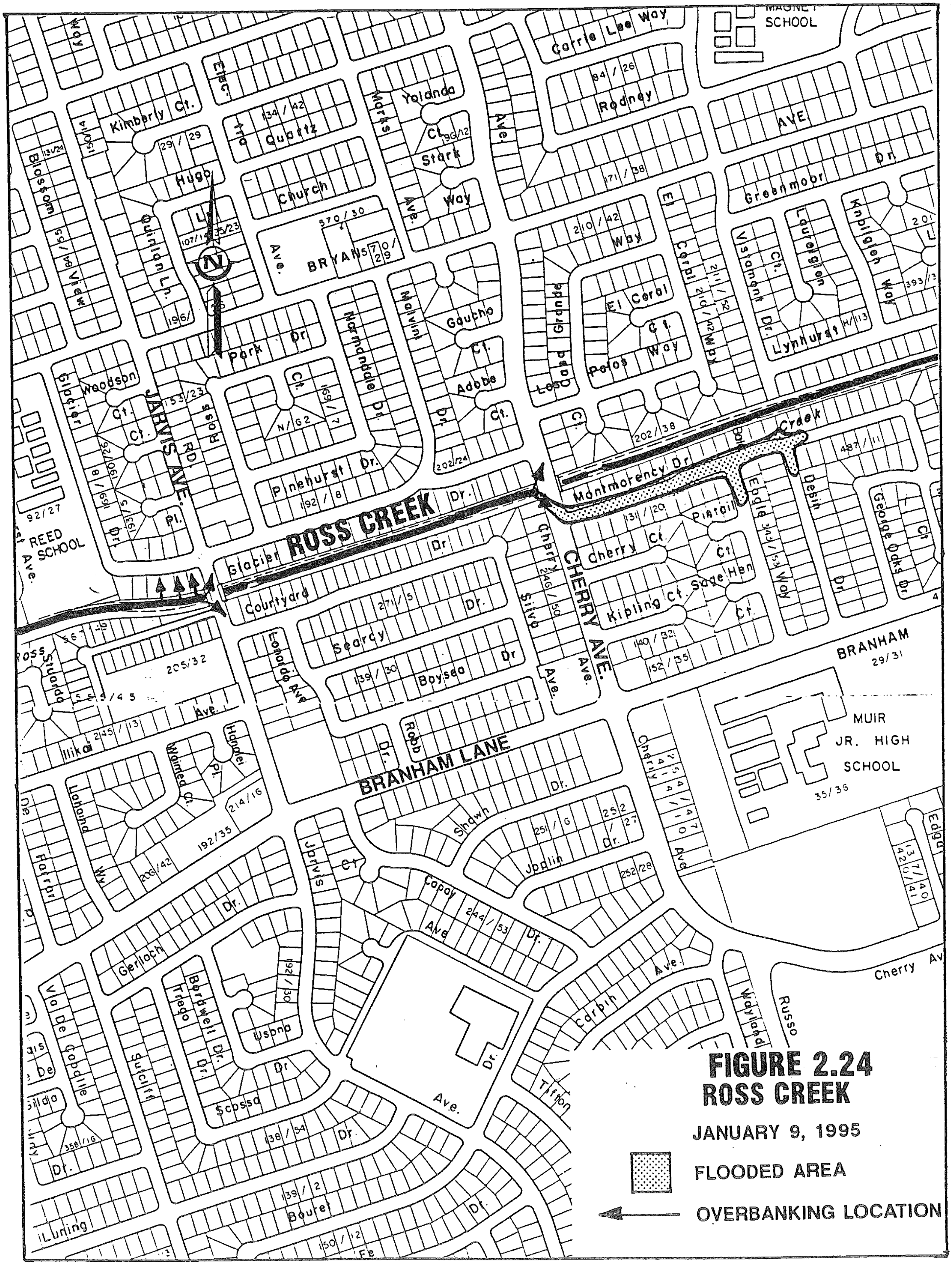


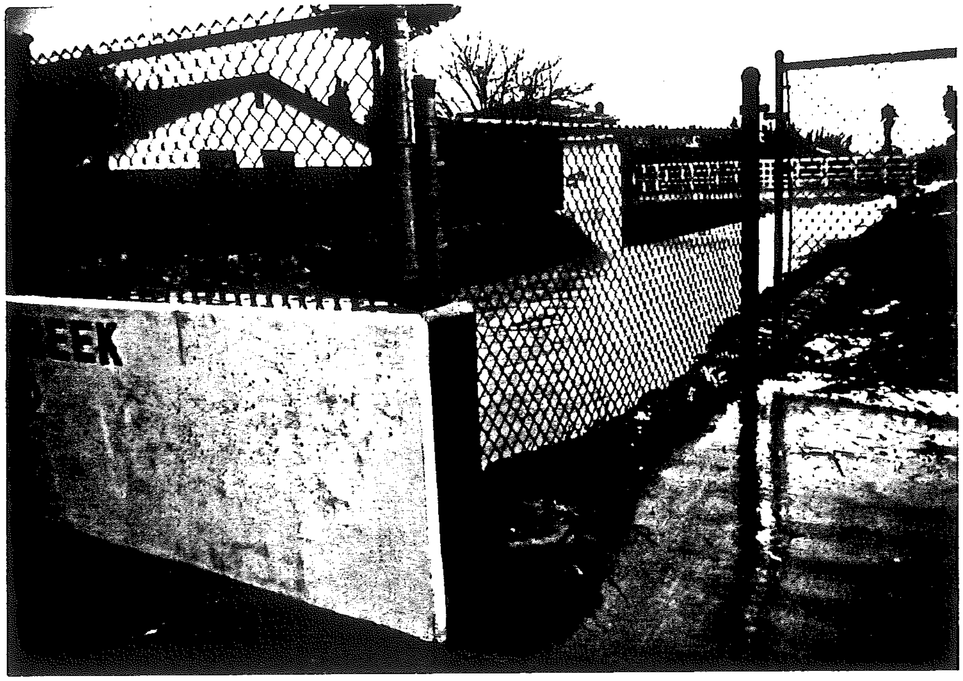
FIGURE 2.24
ROSS CREEK

JANUARY 9, 1995

▨ FLOODED AREA

← OVERBANKING LOCATION

Looking Upstream From Jarvis Avenue Bridge



Looking West Along Montmorency Drive (Note Highwater Line)

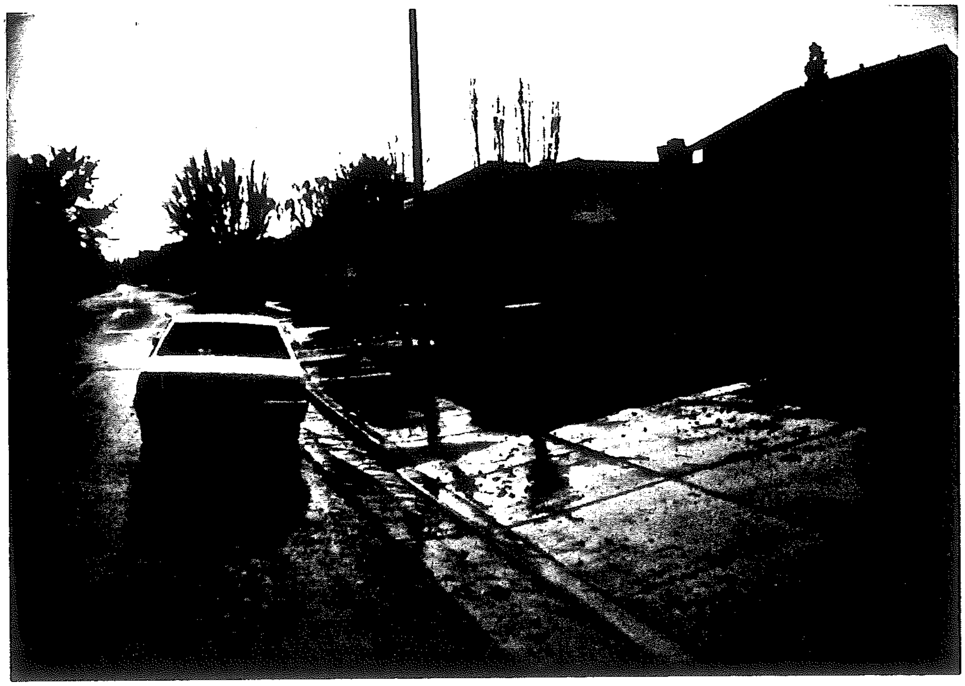


FIGURE 2.25
ROSS CREEK FLOODING IN GUADALUPE RIVER WATERSHED
MARCH 10, 1995

Flooding Problems in Golf and Greystone Creeks

In February 1980, floodwaters caused erosion downstream of Camden Avenue at both Golf Creek and Greystone Creek. At Golf Creek, adjacent to Almaden Expressway, banks were eroded at a sanitary sewer location. Total damages for both creeks amounted to approximately $25,000.

Flooding Problem in Randol Creek

For Randol Creek, historical floodwaters have covered the adjacent area between Bret Harte Drive and Viewpoint Lane.

Description of the 1 Percent Flood in Guadalupe River

The 1 percent flood is that flow of water from a drainage area that, on the average and over a long period of time, has a 1 percent chance of being equalled or exceeded in any given year (see Appendix H). Areas in the Guadalupe River watershed that would be impacted by a 1 percent flood are shown in Figure 2.26. The description of the 1 percent flood is based upon the Federal Emergency Management Agency (FEMA) Flood Insurance Study for San Jose (7). A detailed discussion of the District's hydrology study is contained in Appendix I.

The reach from Blossom Hill Road to Branham Lane is capable of conveying the existing 1 percent flow with only a minor amount of overbanking in the groundwater percolation ponds downstream of Blossom Hill Road. The overbanking would be contained in this area and eventually re-enter the river downstream.

Flow under the Branham Lane bridge would be under pressure and cause overbanking just upstream to the east. Overbanking to the east would also occur downstream between Branham Lane and Ross Creek. These spills would flow northerly, flooding about 270 homes up to 1-foot deep.

Ross Creek would contribute about 1,000 cfs to the flow in Guadalupe River, increasing the flow to 12,500 cfs. The high water surface in the Guadalupe River would create a backwater in Ross Creek and cause an overflow of about 1,400 cfs to the north. The spill would flow northwesterly flooding about 2,100 homes and two schools. Near Pine Avenue, the spill would combine with overflows originating from the Guadalupe River at Malone Road and would continue to flow northwesterly.

From Ross Creek to upstream of the Capitol Expressway bridge, the Guadalupe River channel has capacity to convey the existing 1 percent flow of 12,500 cfs without overflowing. The Capitol Expressway bridge would pass about 11,600 cfs flowing under pressure and force a spill to the east of about 900 cfs. The spill would combine with the spill from Branham Lane and flow to the east down Capitol Expressway combining with additional overflows originating from Canoas Creek. The combination of spills would flow northerly, ponding up to 8 feet deep in a residential area behind the Canoas Creek levees. The floodwaters would not be able to re-enter the Guadalupe or Canoas channels through the storm drains and would eventually cross over Canoas Creek at the Nightingale Drive bridge. Some of these floodwaters would flow into the Mill Pond Mobile Home Park and rise to depths of over 8 feet while some floodwaters would travel north across Curtner Avenue and flow into low lying industrial areas. A portion of these overflows would combine with spills from Coyote Creek near Monterey Road. Sheet flow would continue northwesterly converging towards the Guadalupe River upstream of Interstate 280.

Hillsdale Avenue and northbound Almaden Expressway bridges would pass the remaining 11,600 cfs with over 1 foot of freeboard. Flow in the Guadalupe River increases to 12,800 cfs at the confluence with Canoas Creek between the north and southbound Almaden Expressway bridges. The southbound Almaden Expressway bridge would pass the flow under pressure and downstream of the Curtner Avenue bridge would have about 2 feet of freeboard. Flow under Malone Road bridge would pressurize and cause an overflow upstream to the west of about 830 cfs. Willow Glen Way bridge would pass the remaining 11,900 cfs while flowing under pressure. The UPRR trestle downstream would flow under pressure and cause a spill of 930 cfs to the west. The spill would combine with the spill from Ross Creek and cross the UPRR tracks and flow northerly as sheet flow averaging 2,000 to 3,000 feet in width. These combined overflows would flood about 4,500 homes and businesses to the west of the river and south of Interstate 280.

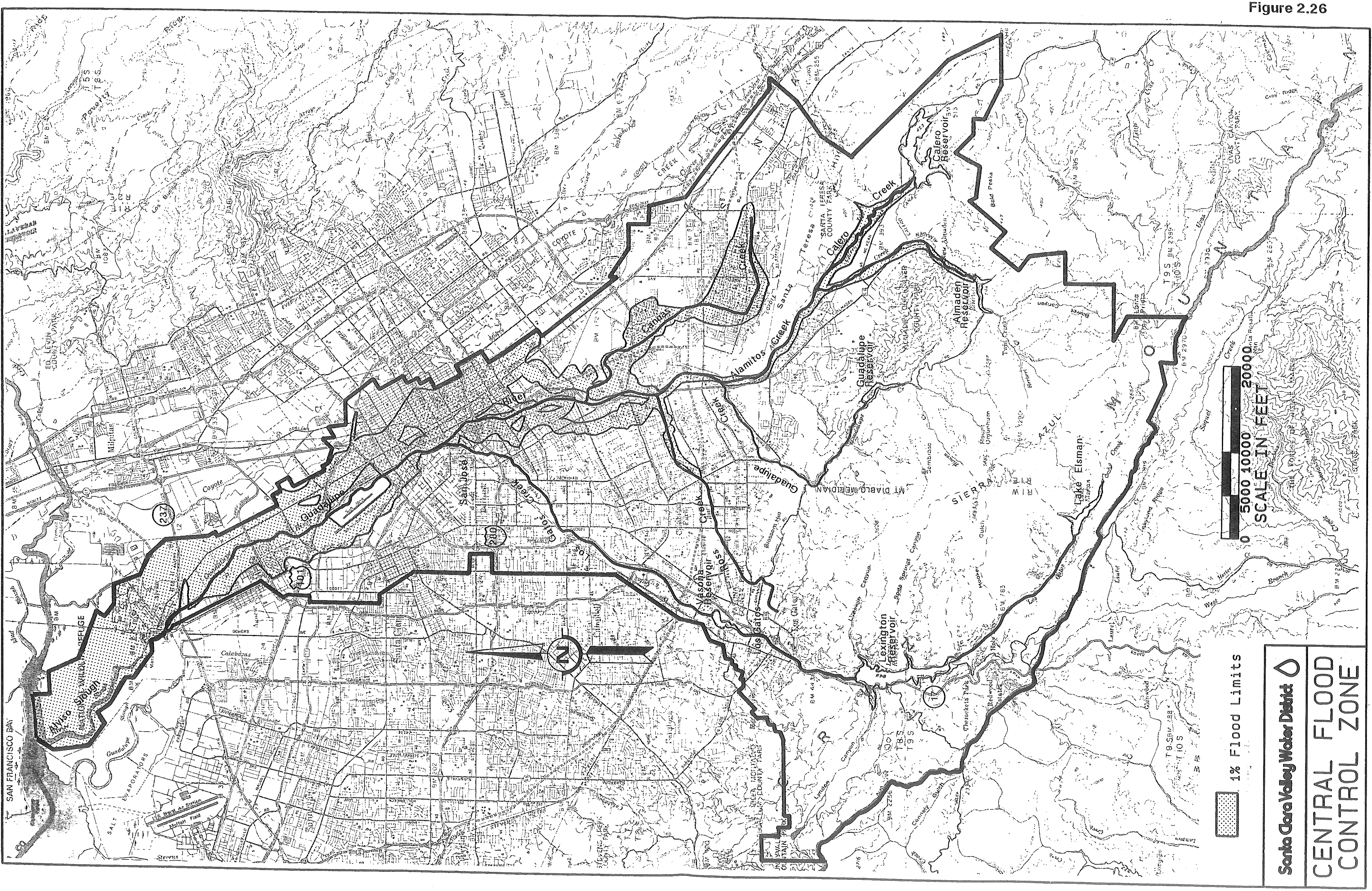
Between UPRR and West Alma Avenue, the Guadalupe River channel has capacity for about 7,000 cfs with the Alma Street bridge flowing under pressure. This would cause about 3,900 cfs of the 10,900 cfs flowing from upstream to overbank to the east. About 3,300 cfs of the spill would cross Alma Avenue into the Tamien Light Rail Station with 2,000 cfs returning to the Guadalupe River downstream of Willow Street. Another 150 cfs would flow east on Alma Avenue under the SPRR undercrossing and combine with spills originating from upstream.

The Willow Street bridge would pass about 7,500 cfs under pressure flow conditions. Just downstream of this bridge the 2,000 cfs spill from upstream of Alma Avenue will enter the channel from the east and increase the flow from 7,500 to 9,500 cfs. The 9,500 cfs would then flow through the SPRR trestle with 6 feet of freeboard. At the West Virginia Street bridge about 8,860 cfs would pass by a combination of pressure and weir flow while the remainder overbanks. The overbank flow then combines with the overland flow originating from upstream.

All overflows converge near Interstate 280 between Almaden Avenue on the east and Freeway 87 on the west. These overflows would then be directed back into the Guadalupe River by the proposed Corps project from Interstate 880 to Interstate 280. This reach from Interstate 880 to Interstate 280 is being constructed by the Corps to contain the 1 percent flow with freeboard.

A summary of the 1 percent flooding and impacts from the Guadalupe River is provided in Table 2.10. Critical facilities which would be flooded is listed in Table 2.11.

Figure 2.26



▨ 1% Flood Limits

Santa Clara Valley Water District

CENTRAL FLOOD CONTROL ZONE

February 1991

TABLE 2.10
Guadalupe River—1 Percent Flooding Summary

Damage Item	Area Flooded (Acres)	Number of Buildings
Single Family Residential	1,500	6,710
Apartment Residential	7	52
Mobile Home	50	450
Commercial	119	158
Industrial	224	74
Schools, Public	25	11
Open Improved Land	83	0
Agriculture Land	114	0
Vacant Land	54	0
Totals	2,176	7,455

TABLE 2.11
Guadalupe River—Critical Facilities Subject to 1 Percent Flooding

Schools	
River Glen Elementary School	Washington School
Canoas Elementary School	Valley View Elementary School
Lincoln Glen Elementary School	Schallenberger School

Maintenance Problems

A major maintenance concern for the Guadalupe River is the lack of access to the channel. The limited access points make proper maintenance work difficult and costly. Another concern is the absence of continuous right of way. District policy will not allow performance of flood control maintenance work on facilities without a permanent right of way.

Historically, the maintenance work has included sediment and debris removal, tree work, erosion repair, and vegetation control. For Guadalupe River, the lack of right of way has limited the maintenance work to hand removal of woody growth along the channel bottom and lower banks. In addition, the District cannot effectively remove debris or repair bank erosion without adequate vehicle access.

In the recent major storms of 1980, 1982, 1983, 1986, and 1995 erosion problems have intensified. Since then, some residents have dedicated easements to the District.

Some elements of the flood control maintenance program in the District are permitted by regulatory agencies, including the CDFG. The CDFG is responsible for the protection and conservation of riparian habitats and fish and wildlife resources.

In addition to the CDFG's Memorandums of Understanding (MOUs), permit from the Corps are required under Section 404 of the Clean Water Act. This permit limits the placement of fill in the creekbed within the ordinary high water boundary. The District's recent regional Corps permit expired in June 1994 and the District is in the process of renewing it. In the past, the Corps has issued 5-year regional permits for routine maintenance.

In the past, individual CDFG permits were required for maintenance activities that constituted a streambed alteration. In August 1990, a MOU concerning routine maintenance activities in improved channels was adopted by the District and the CDFG. The MOU for unimproved channels was adopted in May 1991. These MOUs defined maintenance activities that did not require further notice and agreement in compliance with the Fish and Game code. Both MOUs are included in Appendices K and L.

Reach A (Highway 101 to Interstate 880) was constructed in 1972 and the maintenance guidelines specified that substantial vegetation growth within the channel or on the in-board side slopes would be removed.

In Reaches 6-10A (Interstate 280 to Canoas confluence), the maintenance work has been limited to channel clearing and bank stabilization only in those areas with right of way and maintenance access. The work consisted primarily of removing blockages, such as downed trees, cleaning bridge pier noses of debris, and erosion repair of failed or failing banks, sometimes on an emergency basis. As a result of erosive velocities in the channel, several large erosion repair projects have been constructed at various locations along these reaches in the past 20 years. The banks were stabilized utilizing sacked concrete and rock riprap slope protection. Potential bank failures still exist at various locations along these reaches and erosion repairs are required.

In Reach 10B (Canoas Creek confluence to Stream Gage No. 23B) the channel was constructed in 1976 in conjunction with the Almaden Expressway widening project. The existing maintenance program in this reach is defined by the current MOU (Appendix K).

In the remaining reaches, poor maintenance access and limited District right of way has restricted the maintenance work. In the past, concrete rubble was dumped (although not necessarily by the District) to provide slope protection on the banks at locations where erosive velocities were present. Those locations are at downstream of Hillsdale Avenue Bridge, San Jose Water Company's (SJWC) property, and Ross Creek confluence.

Erosion Problems

Active erosion occurs due to unstable banks throughout the study area. The most severe problems are from Willow Street to Almaden Expressway. In this section, bank erosion is attributed to high-flow velocities which cause scouring at the toe of the creek banks. As the undercut side slopes become saturated, large sections of the banks slough into the channel. Because of the unstable banks, private properties immediately adjacent to the creek are at risk from bank failures and debris blockages. Erosion of the channel banks has denuded numerous areas along the creek of all vegetation. The aesthetic qualities of the creek have also been degraded where concrete rubble or sack concrete were placed to protect steep slopes and eroded channel banks.

Erosion problems have motivated some residents to dedicate right of way to the District. Between 1975 and 1984, the District has spent over $1.3 million for major erosion repairs (see Table 2.12), an average of nearly $200,000/year.

Sedimentation Problems

The most significant sedimentation problems in the Guadalupe River watershed occur between Highway 237 and Montague Expressway. The problems in this area are mainly due to the tidal currents that carry suspended silts from the San Francisco Bay and deposit them in the channel. Over time, benches are formed and vegetation eventually establishes on them. The current average annual cost of removing the sediment and vegetation is approximately $130,000. This cost will likely increase when disposal sites near Guadalupe River are no longer available.

Figure 2.27 shows the sedimentation problem sites.

TABLE 2.12
Guadalupe River—Recent Erosion Repair Costs (1975-1984)

Erosion Location	Cost
1. Willow Glen Way and Old Almaden Road	$ 351,574
2. Willow Street and West Alma Avenue	$ 195,760
3. Malone Road and UPRR	$ 242,851
4. 1,000 feet Downstream Malone Road	$ 104,896
5. West Virginia Street and Edwards Avenue	$ 202,541
6. Downstream of Willow Glen Way	$ 210,570
Total	$1,308,192

Upstream of the tidal zone area, sediment in streams is mostly generated from active channel erosion. This sediment tends to be deposited in areas where the channel is wide and has a mild slope. Some of those areas in the Guadalupe River watershed are between Highway 101 and Interstate 880 and between Branham Lane and Blossom Hill Road in the Guadalupe River, and at Guadalupe and Alamitos Creeks confluence. To date, the need for sediment removal has been infrequent. However, upon completion of improvements to the river in the downtown area by the Corps, cost of sediment removal in the downtown reach are expected to be approximately $100,000 annually.

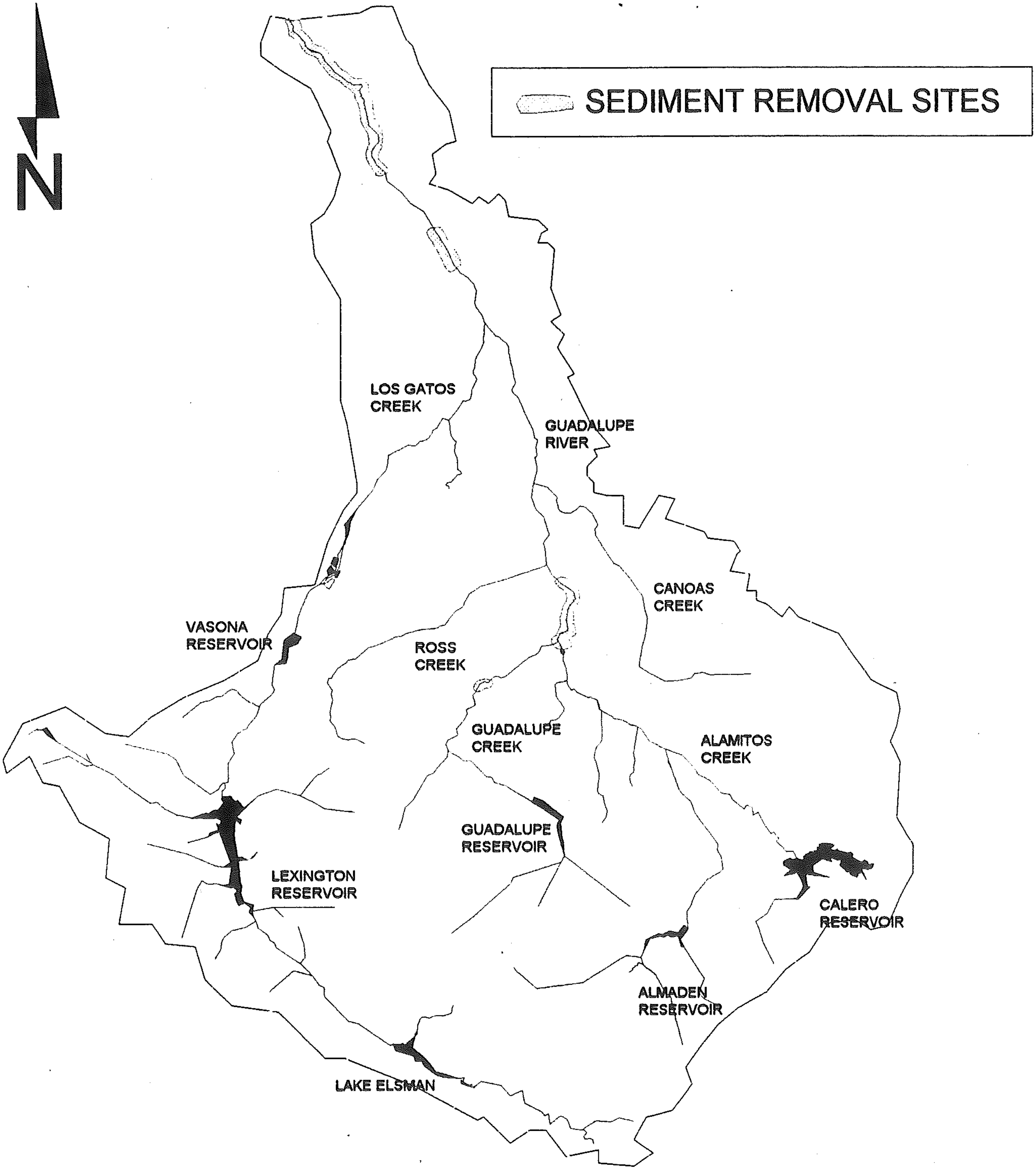


FIGURE 2.27 - SEDIMENT REMOVAL SITES WITHIN THE GUADALUPE RIVER WATERSHED

Fish Passage Problems

Guadalupe River provides important habitat for spawning and rearing of chinook salmon and steelhead trout. Suitable rearing habitats are also available further upstream on Ross Creek, Guadalupe Creek, Alamitos Creek, and Arroyo Calero. However, upstream migration of chinook salmon and steelhead trout has been restricted by the presence of barriers to fish passage. Figure 2.28 shows the sites of barrier to fish passage in the Guadalupe River watershed.

On Guadalupe River, there is a 10-foot high drop structure located near Blossom Hill Road. The District constructed this drop structure to control the profile of the creek and to reduce the flow velocities to protect the streambanks. The District also utilizes this unladdered structure to divert streamflows into percolation ponds as part of it's groundwater recharge program. Downstream of this structure, the physical barriers that could affect steelhead trout and chinook salmon include the weir at Stream Gage Station 23B, the apron and weir at Hillsdale Avenue, and a vehicle crossing downstream of Branham Lane.

Recent field surveys by a fish biologist showed that the gabion structure upstream of Mazzone Drive on Alamitos Creek, Masson Dam, Stream Gage Station 43 and a concrete-lined channel section between Pheasant Creek confluence and Reynolds Road on Guadalupe Creek limit or prohibit fish migration into the upstream areas.

Problems Associated With Gravel Dams

The District constructs spreader dams from streambed gravels each summer on Guadalupe River, Los Gatos Creek, Ross Creek and Guadalupe Creek to enhance groundwater recharge through percolation (Figure 2.2). In order to comply with the Corps permit for construction of these dams, a five-year fisheries study was undertaken in 1989. Based on the results from the study, some problems associated with the gravel dam operations were:

- Construction of gravel dam tends to increase sediment deposition downstream which could inundate suitable spawning substrate in the creek and cause fish eggs mortality in redds downstream of the dam site.
- Dewatering of the ponds during installation and removal of dams would cause loss of resident fish.
- In-channel grading during construction creates a wide and shallow channel that would hinder fish passage.
- Dam removal activities tend to increase turbidity downstream of the dam site.

The District has changed the procedures for construction and removal of the gravel dams to address the concern. The CDFG is presently satisfied with the revisions.

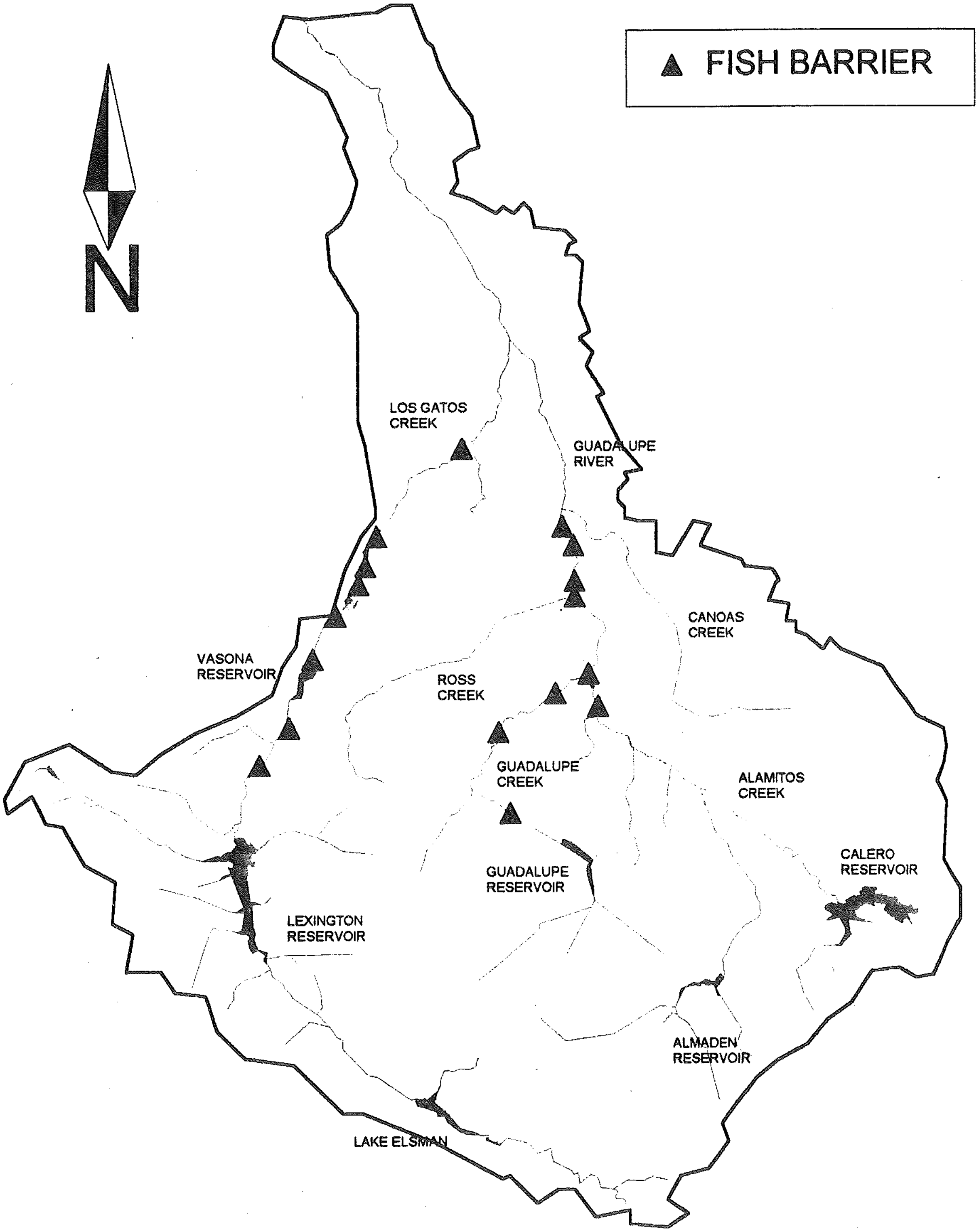


FIGURE 2.28 - POTENTIAL FISH BARRIERS IN THE GUADALUPE RIVER WATERSHED

Local Drainage Problems

Within the context of this study, local drainage is defined as the system of gutters, storm drain inlets, storm sewers, and outfall structures that convey local surface runoff into the creek or flood control channel. The local drainage facilities are owned, operated, and maintained by the cities or property owners whose lands they drain.

Most of the local drainage outlets in Guadalupe River are installed with flap gates to prevent reverse flow. They are designed to discharge into the river by gravity. When the water levels in the river rise above the elevations of the drainage outlets, local runoff would be prevented from entering the channel. Water would accumulate in the streets until the flood flows from the storm had peaked.

CHAPTER 3
CAPITAL IMPROVEMENT PROJECT

PROJECT AREA

As part of this study, the reach of Guadalupe River from Highway 101 to Interstate 880, and from Interstate 280 to Blossom Hill Road was investigated. This reach is at the upper half of the Guadalupe River watershed. The improvement in the lower part of the watershed was included in the San Jose Downtown Corps Project, which has been under construction since 1993. This upper reach is the last portion of the Guadalupe River that: lacks adequate capacity to safely convey the 100-year food flow; lacks continuty for a future trail from Los Alamitos to downtown San Jose; and contains fish barriers that hinder fish migration to upstream habitat. The planning study on Canoas Creek watershed is currently underway and construction is estimated to begin in 2025.

The project area consists of eight subareas called reaches, some of which are further divided into subreaches (Table 3.1). The Corps Phase I Study Report in 1975 defined nine reaches on the Guadalupe River beginning at Interstate 880 and ending upstream at Curtner Avenue. As their study progressed, the three upstream reaches, between Curtner Avenue and Blossom Hill Road, were eliminated from their investigation. The eight reaches of the District study include these reaches. The reach designations originate from those used for the Corps' 1976 study. Figure 3.1 shows the project area and reach limits.

TABLE 3.1
Guadalupe River—Reach Limits

Reach	Subreach	Description
A		Highway 101 to Interstate 880
6		Interstate 280 to SPRR
7	A	SPRR to Alma Avenue
7	B	Alma Avenue to UPRR
8		UPRR to Willow Glen Way
9		Willow Glen Way to Curtner Avenue
10	A	Curtner Avenue to Almaden Expressway (SB)
10	B	Almaden Expressway (SB) to Stream Gage No. 23B
10	C	Stream Gage No. 23B to Capitol Expressway
11	A	Capitol Expressway to SJWC
11	B	SJWC to Ross Creek
11	C	Ross Creek to Branham Lane
12		Branham Lane to Blossom Hill Road

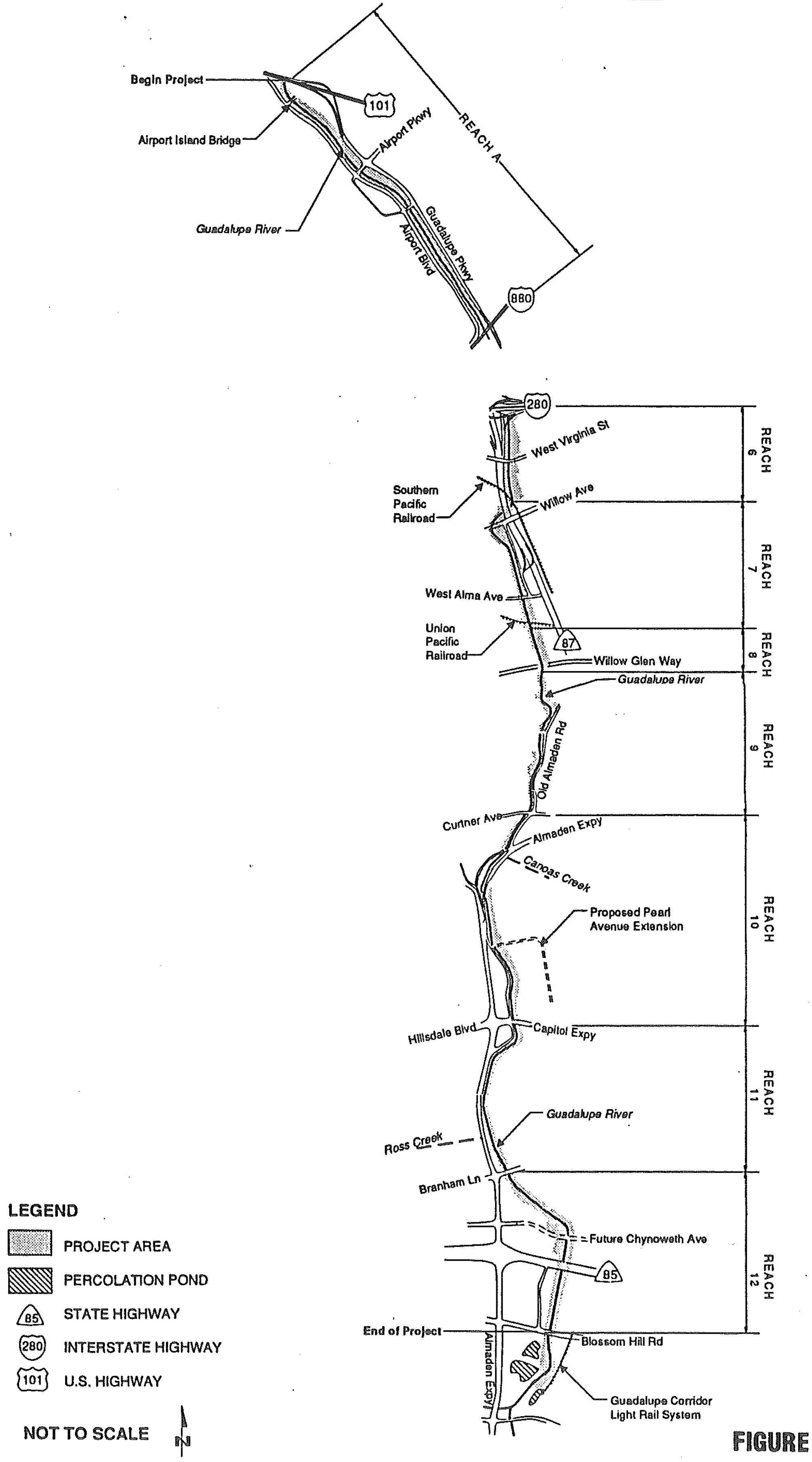


FIGURE 3.1: STUDY AREA

KLEINFELDER	LOCATION OF PROJECT ALIGNMENT GUADALUPE RIVER PROJECT SAN JOSE, CALIFORNIA	PLATE 1
DRAFTED BY: L. Sue DATE: 6-8-94 CHECKED BY: C. Kennedy DATE: 1-19-94	PROJECT NUMBER 12-178000/803	

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CAD FILE: Macintosh, Canvas 3.5, Plate 1

Portions of two tributary creeks are included in the study area. Ross Creek from the confluence with Guadalupe River to Jarvis Avenue and Canoas Creek from the confluence with Guadalupe River to end of Nightingale Drive. Ross and Canoas Creeks are included because Guadalupe River flooding problems cannot be completely solved without containment measures on these tributaries.

PREVIOUS DISTRICT REPORTS

In 1960, the District prepared an Engineer's Report on Proposed Improvements for the Central Flood Control Zone. The study area for the Guadalupe River extended from San Francisco Bay to Branham Lane. This 18 mile length of Guadalupe River was divided into seven reaches, each about 2.5 miles long. Engineering design, construction staging and financing were outlined in detail. Construction was proposed to be in two phases. The first phase consisted of constructing levees downstream of Highway 17, excavating the channel throughout its length and adding drop structures at various locations. The channel capacity would be increased to 12,000 cfs.

The second phase proposed to enlarge bridges and culverts and concrete lining the channel. Capacity would then be adequate for the design flow of 25,000 cfs. None of the proposed improvements were constructed except a portion of phase one adjacent to the San Jose Airport. In this reach, the channel was excavated and earth levees were added.

In August 1970, the District issued a "Report on Proposed Improvements on Guadalupe River and Guadalupe Creek." The reach of Guadalupe River from Branham Lane to the confluence with Guadalupe Creek was proposed to be an excavated earth channel with drop structures. Construction plans were never developed.

A plan was prepared in December 1971 proposing improvements from Koch Lane to Branham Lane. This plan called for a combination of concrete lining, as in the 1960 report, and seminatural areas. In January 1972, the District's Board of Directors directed staff to develop plan lines as a guide for future dedication requirements when development occurred.

In October 1975, an Engineer's Report and Final EIR were completed by the District for the Guadalupe River from Blossom Hill Road and upstream to Coleman Avenue. The selected alternative consisted of channel enlargement with replacement of one drop structure and a percolation pond. Design was completed and construction begun in 1976 and completed in the same year.

In April 1976, in cooperation with the Corps, the District prepared a Study Report for the Guadalupe River from Highway 17 to Curtner Avenue. This report examined the alternative of channel modifications that had previously been screened by the Corps in Phase I of this study. District staff prepared plans and calculated project costs for seven structural channel modifications alternatives. These alternatives were: earth bypass channel, widened earth channel, covered bypass channel, widened rock channel, one bank widening with lining, U-frame concrete channel, and floodwalls

The Corps used the information from the Study Report for their Information Brochure and Phase II Study Report, published in September 1976 and January 1985, respectively.

In April 1977, the District studied an off-stream storage alternative in response to opposition to the floodwalls alternative by residents in the reach from Willow Glen Way to Curtner Avenue. This alternative consisted of expanding the existing Guadalupe River percolation ponds downstream of Blossom

Hill Road to reduce the 1 percent flood peak. Channel modifications would still be necessary through most of Guadalupe River. This alternative was not feasible due to the high cost and the inadequate reduction of flow.

PREVIOUS CORPS REPORTS

The U.S. Congress first authorized the Corps to examine the Guadalupe River and tributaries for flood control under the Flood Control Act of 1941.

In February of 1945, the Preliminary Examination Report for Guadalupe River and Tributaries was issued. The Chief of Engineers authorized a survey of all streams draining into San Francisco Bay south of the Dumbarton Narrows in June of 1945, under the title Guadalupe River and Adjacent Streams.

The survey was initiated in 1948 and then suspended in 1950 due to international conflict. The survey resumed again in 1955. Following the Christmas flood of 1955, the Corps shifted priority from Guadalupe River to San Francisquito Creek. The San Francisquito survey report was completed in 1961.

In Fiscal Year 1963 funds were allotted for resumption of the Guadalupe River and Adjacent Streams study. The Plan of Survey report was prepared by the Corps in June of 1963. In January 1968 the Corps completed the Draft Plan of Survey Report. The report showed no feasible alternatives. The study was then placed in deferred status until changed conditions would warrant resumption of the investigation. The survey was reactivated in Fiscal Year 1972 following the initiation of the Housing and Urban Development model cities program and numerous requests for resumption by local interests.

In January 1972, the Corps prepared a Floodplain Information report on the Guadalupe River. The report contained a brief history of the area and 1-inch equals 2,000-foot scale maps showing the area that would be flooded during the Standard Project Flood and the Intermediate Regional Flood. Flood hydrographs were derived based on the storms of 1955 and 1958.

The Plan of Survey report, which outlined the study, was approved in December of 1972. About the same time, a Citizen's Advisory Committee (CAC) was formed to develop goals and objectives for the study. In June 1973 the CAC adopted a set of goals and objectives.

In April 1974, Dr. Andrew H. Trice presented his report titled "Potential Flood Damages on the Guadalupe River, Coyote Creek, and Adjacent Streams." His findings were based on the floodplain maps in the Corps 1972 Floodplain Information report and showed $50,633,000 in flood damage as a result of the 1 percent event.

George S. Nolte and Associates completed a report for the Corps in August 1974. The report analyzed 20 different alternatives for Coyote Creek and Guadalupe River. None of the alternatives were found to have a benefit cost ratio greater than one. This work was used for the Phase I Study Report that was released by the Corps in January 1975.

The Phase I Study Report incorporated both the detailed economic study by Dr. Andrew Trice and the George S. Nolte and Associates report. This phase screened alternatives for both Guadalupe River and Coyote Creek. The alternatives considered for Guadalupe River were: build new Guadalupe Dam; raise Lexington Dam; alter Lexington Dam's operation; build Hooker Dam; Guadalupe River channelization;

flood proof the Guadalupe River floodplain, and acquisition and abandonment of the floodplain. Only channelization was found feasible for a more detailed study.

In September 1976, the Corps prepared an Information Brochure for the public. The District's Study Report of April 1976 provided information to develop the brochure. The brochure contained details of six possible channel alternatives and gave the public an opportunity to put together a plan using these alternatives as building blocks. The study area from Interstate 880 to Curtner Avenue was divided into nine reaches. Details of the feasible alternatives were shown for each reach. The Corps held a public meeting on the alternatives in September 1976.

The Phase II Study Report was released for public review in January 1985. The Corps held a public hearing on the Draft Environmental Impact Study (EIS) on March 7, 1985. This report recommended the widened earth channel alternative from Interstate 880 (previously Highway 17) to Interstate 280 (Reaches 1 through 5). The reaches south of Interstate 280 were found to be economically infeasible. The Final EIS was released by the Corps in July 1985.

In 1987, due to continued extensive development, the District requested the Corps to reevaluate the potential for a project on the Guadalupe River from Interstate 280 to Blossom Hill Road. The Corps completed a Reconnaissance Report in 1989 which recommended proceeding to the feasibility study phase which is now underway and scheduled for completion in 1997. Pending final authorization and approval of funding, it is estimated that construction of the Corps project could begin in 1998.

FORMULATION OF ALTERNATIVES

This section describes the criteria used in developing alternatives and selecting the preferred plan.

When formulating a project, the District attempts to define solutions which require the minimum amount necessary to solve the problem, for example, to reduce the flood hazard with a minimum environmental impact and cost. All alternatives are formulated, where feasible, to: protect the community from the 1 percent flood; improve water quality in the river; increase water supply potential; solve erosion problems; improve maintenance access; reduce sedimentation problems; provide continuous fish passage to upstream habitat and a continuous riparian corridor for wildlife habitat; and increase recreational development potential which complements the park and trail master plan. Each alternative is assessed for its effectiveness in addressing problems and its impacts on riparian vegetation, wetlands, wildlife habitat, fishery, water supply, local drainage, aesthetic, and recreational potential. The final plan selection is always a balance between sometimes conflicting objectives; for example, a "reasonable" increase in cost may be acceptable if a plan has significantly less adverse impact on the aquatic ecosystem or strong public support.

Potential solutions range from the usually low cost, low impact "do nothing" to the extreme concrete-lined channel which is generally far less desirable, much more costly, and environmentally destructive. The feasibility of each of the various practicable alternative solutions is constrained by many factors but, by far, the most significant is the amount of land available adjacent to the creek.

Environmental Impact Criteria

The impact criteria used in selecting the preferred project follows the CEQA guideline for mitiation, which is: avoiding impacts, minimizing impacts, rectifying impacts, reducing impacts over time, and compensating for impacts.

Engineering Criteria

The preliminary design for all the alternatives complies with the District's design and maintenance policies and is based on generally accepted engineering criteria for flood control projects. The policy of the District is that an improved channel be capable of conveying the 1 percent (100-year) flood with freeboard. The 1 percent level of protection is consistent with the national policy of the FEMA. FEMA is responsible for the administration of the National Flood Insurance Program including the review of flood control projects and the revision of the Flood Insurance Rate Maps.

Design Flow Rate

Table 3.2 lists the design flow rates in cfs for the 1 and 10 percent recurrence intervals at several locations along the Guadalupe River. They are based on the Corps Hydrology Studies and are consistent with design flows used in the Corps' Interstate 880 to Interstate 280 flood control project on Guadalupe River.

TABLE 3.2
Guadalupe River—Design Flow Rates (cfs)

	Annual Probability of Exceedance (Frequency)	
Location	**1% (100-yr)**	**10% (10-yr)**
Upstream of Ross Creek	11,400	3,800
Downstream Ross Creek	12,400	4,600
Upstream of Canoas Creek	12,400	4,600
Downstream of Canoas Creek	14,600	6,500
Downstream of Los Gatos Creek	17,000	12,800

Channel Roughness

One parameter used in the design of flood control channels is the channel roughness factor (Manning's 'n'). A composite roughness factor is used for nonuniform channel sections. The cross section of a channel may be composed of several distinct subsections with each subsection different in roughness from the others. The composite roughness value is based on a combination of the roughness factors for multiple sections across the channel. Typical values for the uniform roughness are shown in Table 3.3 and roughness values used to compute composite roughness are shown in Table 3.4.

TABLE 3.3
Guadalupe River—Design Channel Uniform Roughness Factors

Channel Type	Low `n' for Velocity	High `n' for Stage
Existing Natural Vegetation (Unmaintained)	0.050	0.070
Excavated Earth/Designated Floodways (No Woody Growth)	0.025	0.030
Revegetated Bench	0.030	0.090
Revegetated Invert	0.030	0.060
Maintenance Roads	0.020	0.025
Stepped/Mattress Gabions	0.030	0.035
Rock-Lined (Invert Only)	0.030	0.035
Sacked Concrete Slope Protection (SCSP)	0.030	0.030
Concrete	0.015	0.015
Cribwall	0.020	0.025

TABLE 3.4
Guadalupe River—Design Channel Composite Roughness Factors

Description	Roughness `n'
Existing Natural Bank with Vegetation	0.090-0.100
Revegetated Excavated Earth	0.080
Earth Bench With Grasses/Weeds	0.035
Revegetated Gabions	0.035
Channel Invert	0.025
Maintenance Roads	0.025

Velocity

Using the low roughness factors, the flow velocities are not-to-exceed 9 feet per second (fps) for an existing channel. Flow velocities in excavated earth channel reaches are not-to-exceed 7 fps. Where flow velocities exceed the allowable, some type of armor protection is provided. Examples of armor protection include rock riprap and gabions.

Freeboard

Using the high roughness factors, the following are the criteria for freeboard:

1. Existing bridges: Pressure flow is acceptable; however, the bridge must be able to withstand all lateral and uplift forces.

2. New bridges; freeboard below soffit must be equal to that value used for the channel upstream or downstream of the bridge, whichever is larger.

3. Channels with earth levees; freeboard is 3½ feet with an additional ½ foot within 100 feet of a bridge.

4. Concrete floodwalls; freeboard is 3½ feet.

5. Where the design water surface is below adjacent ground, freeboard is at least 1-foot or 2/10 the energy, whichever is greater.

Maintenance Access

The District's design guidelines provide maintenance access roads 18 feet wide where possible. Maintenance access ramps must be at least 12 feet wide with a maximum slope of 20 percent for concrete-lined ramps and 15 percent for aggregate base ramps. Slopes of 5 percent are used on potential trail alignments to comply with American Disabilities Act requirements.

Design Constraints

An important design consideration for the Guadalupe River within the study area is its influence on the two tributary creeks—Ross and Canoas. A high water surface in the Guadalupe River during storm events causes a backwater on both tributaries under the existing conditions.

The problem on Ross Creek is due largely to its low banks in comparison with the Guadalupe River. Bank elevations along the Guadalupe River (near the Ross Creek confluence) are about 170 feet National Geodetic Vertical Datum (NGVD) versus about 166 feet on Ross Creek. Because the existing 1 percent water surface elevation on the Guadalupe River is about 168 feet (from FEMA studies), backflow from the Guadalupe River can occur.

Canoas Creek has a backwater problem similar to that of Ross Creek. The existing water surface elevation in the Guadalupe River is about 144.5 feet while the existing levee elevations on Canoas Creek are only about 143 feet.

Adverse impacts of the proposed design on either creek will be mitigated. The impacts will be determined by comparing the existing conditions to future design conditions on Guadalupe River. The design 1 percent flow rates of Ross and Canoas Creeks are shown in Table 3.5.

TABLE 3.5
Ross Creek and Canoas Creek Design Flow Rates (cfs)

Location	1%	10%
Ross Creek at Meridian Avenue	1,800	1,200
Ross Creek Upstream Guadalupe River	2,200	1,300
Canoas Creek at Capitol Expressway	2,000	1,900
Canoas Creek Upstream Guadalupe River	2,400	2,000

ALTERNATIVES FEASIBILITY AND THEIR SIGNIFICANT IMPACTS

The alternatives considered can be divided into six general categories and are summarized in Table 3.6.

“No Project” Alternative

Under the “no project” alternative, the District would not take any action on the Guadalupe River except routine maintenance work, which is done on a priority basis but without an overall plan for the creek. Residents and businesses within the floodplain would continue to face potential hardships due to flooding. Private properties immediately adjacent to the creek would continue to be at risk from stream bank failure and debris blockage. Flooding could still be expected to occur on the average of about once every 4 years. Ongoing active erosion could be expected to continue and possibly damage adjacent properties and trees within the riparian corridor. Water quality and creek environment will continue to degrade. Implementing future park and trail master plans will be difficult. Fish passage for upstream migration will not be restored. Annual maintenance and erosion repair costs could be expected to continue at about $200,000 each year as they have been the last several years.

In the event of the 1 percent flood, approximately 2,200 acres would be inundated. Over 7,200 homes, 230 businesses, 11 public buildings, and 1,390 automobiles would be inundated by floodwaters from Guadalupe River. Sediment deposition on roadways would result in additional cleanup costs. One percent flood damages of over $200 million (1995 present worth) could be expected. Average annual damages would be an estimated $16.5 million per year.

Homeowners and businesses residing in the 1 percent floodplain, where flood depths are 1-foot or greater, would still be required to purchase flood insurance through the NFIP[1]. Insurance premium costs to the owners of the 3,850 structures covered by the program would be over $1 million annually.

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[1] Mandatory participation in the program is required if the owner has a federally insured loan, Public Law 93-234, the "Flood Protection Act of 1973."

TABLE 3.6
Guadalupe River—Summary of Conceptual Alternatives

	Conceptual Alternatives						
	Existing Conditions	**No Project**	**Nonstructural**	**Upstream Reservoirs Construction with Channel Modifications**	**Change Upstream Reservoirs Operation with Channel Modifications**	**Offstream Storage with Channel Modifications**	**Channel Modification**
Description Conceptual Alternatives	Major problems are water quality degradation and lack of adequate capacity to carry 1 percent design flow. Other significant problems are erosion, sedimentation, local drainage, degraded fish habitat, fish passage, and maintenance problems.	No measures taken to reduce current risk of flooding. Mandatory flood insurance required in floodprone areas. Ongoing erosion would be repaired on an emergency basis. Existing condition would remain if not worsened.	Flood damage to structures would be solved without channel modifications. 7,200 structures would be floodproofed. Regulate floodplain development does not apply because the floodplain is already well developed. Ongoing erosion would be repaired on an emergency basis. Existing condition would remain.	Construct new Guadalupe Dam and enlarge Almaden Dam to reduce peak flow rate downstream. Significant channel modifications would also be required in Reaches 6 to 10A. Mitigate the impacts on site and on adjacent lands.	Alter operation of three water supply reservoirs to flood control. Significant channel modifications would also be required in Reaches 6 to 10A. Mitigate the impacts on site and on adjacent lands.	Build diversion structure and offstream detention ponds to reduce peak flow rate in channel. Significant channel modifications would also be required in Reaches 6 to 10A. Mitigate the impacts on site and on adjacent lands.	Modify existing stream channel to contain the 1 percent flood and resist scour from high velocities. Mitigate the impacts on site and on adjacent lands.
Flooding Problems	High risk of flooding, continue mandatory flood insurance.	Existing condition would remain. Expected annual flood damages of $9.2 million.	Flooding would still occur causing some damages, disruption of services and resulting in cleanup costs.	Reservoirs alone would not eliminate the threat of 1 percent flood and the mandatory flood insurance. Additional channel modifications would provide 1 percent protection.	Change of reservoirs operation alone would not eliminate the threat of 1 percent flood and the mandatory flood insurance. Additional channel modifications would provide 1 percent protection.	Offstream ponds alone would not eliminate the threat of 1 percent flood and mandatory flood insurance. Additional channel modifications would provide 1 percent protection.	Eliminate the threat of 1 percent flood and mandatory flood insurance.
Maintenance Concerns	Poor maintenance access, requires intense maintenance. Discontinuous right of way and easements	Existing condition would remain.	Existing condition would remain.	Improve maintenance access, requires less intense maintenance in Reaches 6 to 10A.	Improve maintenance access, requires less intense maintenance in Reaches 6 to 10A, but more at reservoirs.	Improve maintenance access, requires less intense maintenance in Reaches 6 to 10A.	Improve maintenance access, requires less intense maintenance in Reaches A to 12.
Erosion Problems	Active erosion occurs due to steep and unstable banks.	Existing condition would remain if not worsened. Erosion repair on priority basis.	Existing condition would remain. Erosion repair on priority basis.	Repair areas of active erosion, decreases erosion potential in Reaches 6 to 10A.	Repair areas of active erosion, decreases erosion potential in Reaches 6 to 10A.	Repair areas of active erosion, decreases erosion potential in Reaches 6 to 10A.	Repair areas of active erosion, decreases erosion potential in Reaches A to 12.

TABLE 3.6
Guadalupe River—Summary of Conceptual Capital Improvement Alternatives
(continued)

	Conceptual Alternatives						
	Existing Conditions	**No Project**	**Nonstructural**	**Upstream Reservoirs Construction with Channel Modifications**	**Change Upstream Reservoirs Operation with Channel Modifications**	**Offstream Storage with Channel Modifications**	**Channel Modification**
Sedimentation Problems	Periodic removal of sediment in the channel bottom.	Existing condition would remain.	Existing condition would remain.	Requires less frequent sediment removal in Reaches 6 to 10A.	Requires less frequent sediment removal in Reaches 6 to 10A.	Requires less frequent sediment removal in Reaches 6 to 10A.	Requires less frequent sediment removal in Reaches A to 12.
Local Drainage Problems	Long duration and high frequency of flooding in the streets and local ponding.	Existing condition would remain.	Existing condition would remain.	The duration and frequency of flooding in the streets and local ponding would decrease slightly.	The duration and frequency of flooding in the streets and local ponding would decrease slightly.	The duration and frequency of flooding in the streets and local ponding would decrease slightly.	The duration and frequency of flooding in the streets and local ponding would decrease slightly.
Water Quality Problems	Degraded water quality.	Existing condition would remain if not worse.	Existing condition would remain if not worse.	Some improvement in water quality due to improved creek environment in Reaches 6 to 10A.	Some improvement in water quality due to improved creek environment in Reaches 6 to 10A.	Some improvement in water quality due to improved creek environment in Reaches 6 to 10A.	Improvement in water quality due to improved creek environment in Reaches 6 to 12.
Water Supply Impacts	Limited water supply potential.	Existing condition would remain.	Existing condition would remain.	Increase water storage capacity in the summer months at reservoirs.	Loss of 13,900 acre-foot/year because reservoirs would be kept empty during the winter months at the cost of $5 million/year. Supplemental water may not be readily available for purchase. There may be regulatory constraints in the federal and state systems that impact the ability to import water to the county.	Increase groundwater recharge potential in the summer months at the off-stream ponds.	Small increase groundwater recharge potential at Reach 12.

TABLE 3.6
Guadalupe River—Summary of Conceptual Capital Improvement Alternatives
(continued)

	Conceptual Alternatives						
	Existing Conditions	**No Project**	**Nonstructural**	**Upstream Reservoirs Construction with Channel Modifications**	**Change Upstream Reservoirs Operation with Channel Modifications**	**Offstream Storage with Channel Modifications**	**Channel Modification**
Riparian Vegetation Impacts	Degraded and discontinuous riparian corridor.	Existing condition would remain if not worse.	Existing condition would remain if not worse.	Major impacts to 1.6 creek miles and 167 acres of riparian vegetation at reservoir sites. Additional impacts to 2.7 creek miles from channel modifications. Impacts mitigated partially on site and on adjacent lands would reestablish a continuous riparian corridor along the stream in Reaches 6 to 10A.	Impacts mitigated on site and on adjacent lands would reestablish a continuous riparian corridor along the stream in Reaches 6 to 10A.	Impacts mitigated on site and on adjacent lands would reestablish a continuous riparian corridor along the stream in Reaches 6 to 10A.	Impacts mitigated on site and on adjacent lands would reestablish a continuous riparian corridor along the stream in Reaches A to 12.
Wetland Impacts	Moderate wetland habitat.	Existing condition would remain if not worse.	Existing condition would remain if not worse.	Major impacts to wetlands at reservoir sites and from channel modifications. Impacts can only be partially mitigated in Reaches 10 and 12.	Major impacts to wetlands at reservoir sites and from channel modifications. Impacts can only be partially mitigated in Reaches 10 and 12.	Mitigate by creating wetlands in Reaches 10 and 12.	Mitigate by creating wetlands in Reaches 10 and 12.
Wildlife Habitat Impacts	Moderate wildlife habitat.	Existing condition would remain if not worse.	Existing condition would remain if not worse.	Major impacts to wildlife habitat at reservoir sites and from channel modifications. Impacts mitigated partially on site and on adjacent lands would reestablish a continuous wildlife corridor along the stream in Reaches 6 to 10A.	Major impacts to wildlife habitat at reservoir sites and from channel modifications. Impacts mitigated partially on site and on adjacent lands would reestablish a continuous wildlife corridor along the stream in Reaches 6 to 10A.	Impacts mitigated on site and on adjacent lands would reestablish a continuous wildlife corridor along the stream in Reaches 6 to 10A.	Impacts mitigated on site and on adjacent lands would reestablish a continuous wildlife corridor along the stream in Reaches A to 12.

TABLE 3.6
Guadalupe River—Summary of Conceptual Capital Improvement Alternatives
(continued)

	Conceptual Alternatives						
	Existing Conditions	**No Project**	**Nonstructural**	**Upstream Reservoirs Construction with Channel Modifications**	**Change Upstream Reservoirs Operation with Channel Modifications**	**Offstream Storage with Channel Modifications**	**Channel Modification**
Fishery Impacts	Degraded fish habitat, existing fish barriers prevented fish from migrating upstream, limited low flow channel.	Existing condition would remain if not worse.	Existing condition would remain if not worse.	Major impacts to fish habitat at reservoir sites and from channel modifications. Impacts mitigated partially on site and on adjacent lands would reestablish a continuous low flow channel in Reaches 6 to 10A.	Major impacts to fish habitat at reservoir sites and from channel modifications. Loss of water releases from reservoirs in summer months. Impacts mitigated partially on site and on adjacent lands would reestablish a continuous low flow channel in Reaches 6 to 10A.	Impacts mitigated on site and on adjacent lands would reestablish a continuous low flow channel in Reaches 6 to 10A.	Impacts mitigated on site and on adjacent lands would reestablish a continuous low flow channel in Reaches A to 12, and remove all fish barriers and provide fish passage to upstream habitat.
Aesthetic Impacts	Degraded aesthetic qualities due to concrete rubble and sacked concrete used for erosion repair, illegal dumping, nonpoint source pollution.	Existing condition would remain if not worse.	Existing condition would remain if not worse.	Implement better environmental approach to erosion repair work, provide better maintenance access for cleanup and improve creek environment in Reaches 6 to 10A.	Implement better environmental approach to erosion repair work, provide better maintenance access for cleanup and improve creek environment in Reaches 6 to 10A.	Implement better environmental approach to erosion repair work, provide better maintenance access for cleanup and improve creek environment in Reaches 6 to 10A.	Implement better environmental approach to erosion repair work, provide better maintenance access for cleanup and improve creek environment in Reaches A to 12.
Recreation Impacts	No access to the river corridor, no recreation potential.	Existing condition would remain.	Existing condition would remain.	Increase recreation area at reservoirs during the summer months in Reaches 6 to 10A.	Increase recreation area at reservoirs during the summer months in Reaches 6 to 10A.	Increase recreation area around the ponds in Reaches 6 to 10A.	Maintenance access and roads are designed to allow for future trail development connecting Los Alamitos to downtown San Jose.
Cost as 1995 Present Worth		$200 million in flood damages	$600 million	$173 million	$120 million	$600 million	$122.2 million
Time to Complete Project				50 years	40 years		25 years

TABLE 3.6
Guadalupe River—Summary of Conceptual Capital Improvement Alternatives
(continued)

	Conceptual Alternatives						
	Existing Conditions	**No Project**	**Nonstructural**	**Upstream Reservoirs Construction with Channel Modifications**	**Change Upstream Reservoirs Operation with Channel Modifications**	**Offstream Storage with Channel Modifications**	**Channel Modification**
Summary		Not selected because it does not solve the significant flooding, erosion, water quality, and creek environmental degradation problems.	Not selected due to high cost. Residual damages from flooding continuned. It does not solve the significant water quality and creek environmental degradation problems.	Not selected because of the substantial impact to the riparian ecosystem and the high cost of construction.	Not selected because of substantial adverse impact on availability of water and the uncertainity of relying on additional imported water due to increasingly stringent protection measures for the environment in the Delta.	Not selected because of high cost.	Selected because it achieves most of the District's goals and objectives.

New development within the floodplain would require flood-proofing of the structures. There are more than 160 acres in the floodplain which are expected to be developed by the year 2000[2]. The estimated incremental new development cost for flood-proofing is nearly $3 million

The "no project" alternative is considered infeasible and impracticable because of its high cost in flood damages and it does not solve the significant flooding, erosion, water quality, and creek environment degradation problems.

Nonstructural Plan

A nonstructural alternative would solve the flooding of structures in the floodplain without channel modifications. The structures would either be flood proofed or purchased and removed. Regulate floodplain development does not apply because the floodplain is already well developed. Flooding would still occur on the average of every 4 years causing disruption in services, street flooding, and resulting in clean up costs.

Erosion would be expected to continue, requiring repair when structures are threatened. Water quality and creek environment will continue to degrade. Implementing a future park and trail master plan will be difficult. Fish passage for upstream migration will not be restored.

This alternative is considered infeasible and impracticable due to the high cost of flood proofing over 7,200 structures in the floodplain (over $600 million), the social impact of relocating families and removing homes, the continuing erosion and the residual damages from flooding, and the continuing water quality and creek environment degradation.

Upstream Storage (Reservoir Construction)

Three upstream storage alternatives were investigated by the Corps in the 1975 Phase I Study Report (20). Two of the alternatives were on the Los Gatos Creek and would have only benefitted the Guadalupe River downstream of the confluence with Los Gatos Creek.

The third alternative proposed construction of a new 50-foot high dam on Guadalupe Creek approximately 2 miles downstream of the existing Guadalupe Reservoir with a capacity over 2,000 acre-feet (see Figure 3.2). The "New Guadalupe Dam" alternative was investigated and the Corps determined that such a measure would only reduce the 1 percent flow rate by 1,700 cfs, which is not sufficient to avoid extensive channel modifications downstream on the Guadalupe River. The alternative was eliminated from further consideration by the Corps because of the low benefit-to-cost ratio (.33).

In 1978, the District investigated the feasibility of modifying the existing Almaden Reservoir. Of the three reservoirs on upstream tributaries, Almaden has the largest drainage area (12 square miles) but the smallest storage capacity (1,780 acre-feet).

By raising the existing Almaden Dam by 50 feet, a reservoir with a total storage capacity of 4,400 acre-feet would be created. The additional 2,620 acre-feet would reduce the 1 percent flow by about 1,800 cfs on the Guadalupe River at Blossom Hill Road. Therefore, the combination of raising the Almaden Dam and constructing the "New Guadalupe Dam" would reduce the Guadalupe River 1 percent flow rate by about 3,500 cfs at Blossom Hill Road. This would still require extensive channel modifications in some of the downstream reaches on Guadalupe River and the acreage of impacts on the existing riparian vegetation would be significant.

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[2] Based on the "Horizon 2000 General Plan" adopted by the City of San Jose, November 7, 1984.

This alternative would inundate the stream corridor environment for 1.6 miles and the adjacent riparian vegetation totaling 76 acres at the "New Guadalupe Dam" site. Raising Almaden Dam would inudate an additional 91 acres of riparian vegetation.

The cost estimates for construction of the new Guadalupe and raising Almaden Dams are $25 million and $33 million respectively. The additional cost of channel modifications in Reaches 6-10A would be about $50 million making the total construction cost of this alternative an estimated $108 million. The additional mitigation cost is estimated at $65 million. This alternative assumes that mitigation lands are available.

This alternative is considered infeasible and impracticable because (1) the reduction in flow rate is not sufficient to eliminate the need for channel modifications and associated impacts in the study area, (2) the substantial inundation to the riparian ecosystem at the dam sites, and (3) the cost of construction and mitigation is too high. Creek environment from Reaches 10 to 12 will continue to degrade. Implementing a future parks and trail master plan will be difficult. Fish passage for upstream migration will not be restored.

Upstream Storage (Reservoir Operation)

Another upstream storage alternative investigated was to modify the existing reservoir operations for temporary attenuation of flood peak flow through flood-routing.

This alternative proposed to modify the outlets at Almaden, Calero, and Guadalupe Reservoirs and keep them empty in the winter months to maximize flood capacity. The existing reservoirs do not have sufficient capacity and are not strategically located to have a significant impact on the downstream flood hydrograph. The watershed area in the study reach ranges from 53.2 square miles in Reach 12 to 95.3 square miles in Reach 6 and the drainage area for all three reservoirs totals less than 25.0 square miles.

This alternative would only reduce the Guadalupe River 1 percent flow by 2,200 cfs which would still require extensive channel modifications in the downstream reaches on the Guadalupe River. The acreage of impacts on existing riparian vegetation would be significant. (The additional cost of channel modifications in Reaches 6-10A is estimated for $60 million.)

This alternative would cause a loss of 13,900 acre-feet/year in local water supply yield which would need to be replaced at approximately $350/acre-feet (AF), an annual cost of $4,865,000/year. The water might not be readily available for purchase and there may be hydraulic and/or regulatory constraints in the federal and state system that impacts the ability to import the water to the county. Furthermore, the purchase of significant imported water may have significant impacts on the area of export, the bay and delta.

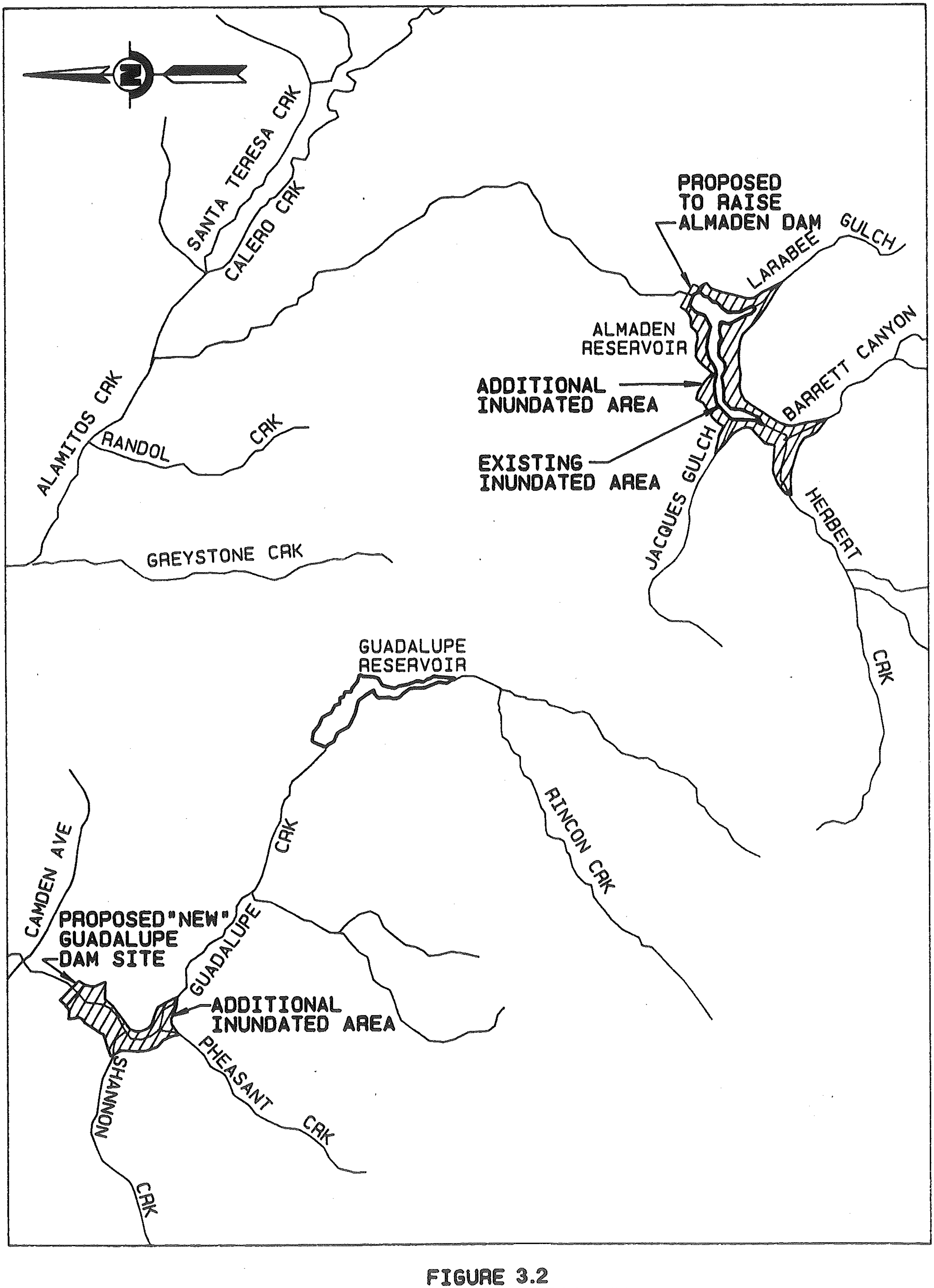

FIGURE 3.2
UPSTREAM STORAGE ALTERNATIVES

This alternative is considered infeasible and impracticable (1) the reduction in flow is not sufficient to eliminate required channel modifications and associated impacts in the study area; (2) the three existing reservoirs currently supplying 13,900 AF/year of water to Santa Clara County would have to be kept empty in the winter months and this water would be considered lost; (3) affects District's ability to store water that will be used during drought period; (4) may forego water rights, which contradicts the District's goal of making full use of economically feasible local water supplies; (5) increases the county's projected water needs at the year 2020; and (6) the uncertainty of relying on additional imported water due to increasingly stringent protection measures for the environment in the Delta. This would also have a substantial adverse effect on the availability of water and, therefore, fishery between May and September. Creek environment from Reaches 10 to 12 will continue to degrade. Implementing a future park and trail master plan will be difficult. Fish passage for upstream migration will not be restored.

A hydrologic analysis was performed to compare the three existing reservoirs operation with the natural runoff characteristics of the Guadalupe River watershed and how each case met predetermined flow requirements for the fishery resource. The results showed that the reservoir operation has very little or no adverse effect as it only altered slightly the natural runoff characteristics of the watershed. If greater flows were released in the wetter months it would not significantly change or enhance the fishery from October through April, but would have substantial adverse effect on the availability of water, and therefore fishery, between May and September. The detailed analysis is contained in Appendix O.

Off-Stream Storage

The concept of this alternative is to reduce the Guadalupe River 1 percent flow rate to an amount that can safely pass through the downstream channel by diverting flow into an off-stream storage pond. This would reduce the required downstream channel improvements. This alternative was investigated in detail in a 1976 report prepared by District staff (13). The objective of the plan was to eliminate the channel modifications measures that were proposed for Reaches 9-10A (Willow Glen Way to Canoas Creek).

The technical feasibility of this proposal is highly risky. The 1976 report showed that this plan must be designed to a very specific hydrograph peak, shape, and volume. Any deviation and the plan becomes dramatically ineffective. To improve the reliability of this plan with 20 percent contingency in peak flow, the storage volume required would be 6,250 AF.

The existing groundwater recharge ponds and adjacent area north of Blossom Hill Road was the only site large enough and at the necessary location to be considered. The total storage volume of the existing ponds is only about 650 AF. An additional 332 acres of land would need to be purchased and excavated approximately 17 feet deep to provide the additional 5,600 AF of storage. Some of the land has since been developed with condominiums and freeways, and therefore, no longer available.

Hydrologic constraints would require that the storage ponds be kept completely dry. This would be difficult due to variable groundwater levels, infiltration from adjacent recharge facilities, and other operational limitations. Once used to store floodwater, the ponds could not continue to operate as groundwater recharge facilities because the silt and debris would clog infiltration.

This alternative would still require some channel modifications in Reaches 6-8 to provide 1 percent capacity which would cost about $55 million.

This alternative is considered infeasible and impracticable because of high cost ($600 million—over $400 million is real estate cost). With the alternative, creek environment in Reaches 9 to 12 will continue to degrade. Implementing a future park and trail master plan will be difficult. Fish passage for upstream migration will not be restored.

Channel Modifications

This alternative proposed to modify existing stream channel to contain the 1 percent flood.

This alternative is considered feasible and practicable because it achieves most of the District's goals and objectives. the unavoidable impacts to riparian vegetation and wetland will be mitigated on site. This alternative will improve maintenance access and require less frequent maintenance in the natural channel. It will also reestablish a continuous riparin corridor along the creek and fish passage to upstream habitat. Implementing future trail master plan will be possible.

The following presents the descriptions of the different feasible channel modification alternatives investigated for each reach of the channel within the study area. These descriptions include a discussion of the different impacts of the alternatives and their estimated costs. The conservative 3:1 mitigation ratio for riparian vegetation impacts is for estimating and comparison purposes only.

Reach A: Highway 101 to Interstate 880

The river is straight and wide through this reach with side slopes varying from 1:1 to 2:1. The Airport Parkway and Airport Island bridges cross the river.

This reach has the capacity to contain the 1 percent flow but does not have adequate freeboard. There are some erosion problems in this reach.

The selected flood control alternative in this reach is compatible with the improvements proposed by Caltrans for Highway 87. In the interim, before Highway 87 is constructed, levees up to 3 feet high will be constructed on both banks.

The current plan for the Guadalupe Expressway Corridor improvements (Highway 87) is to raise the existing road between 4 feet to 18 feet and to excavate the east bank of the river between Airport Boulevard to I-880. The excavation would create a depressed bench up to 110 feet wide which would be used for maintenance access and for mitigation plantings for the highway project.

The only alternative considered in this reach is to lower the existing maintenance road on the west bank at Highway 101, Airport Island bridge, Airport Parkway bridge, and future Skyport Drive bridge to provide underpasses for a continuous maintenance road. The bank would be protected with stepped gabions at a 1:1 slope at the underpass. Ramps would also be constructed intermittently to provide maintenance access to channel bottom.

The estimated cost of this alternative is $1.3 million.

Reach 6: Interstate 280 to SPRR

The river is generally straight in this reach and the banks have side slopes varying from 1:1 to 2:1. High velocities that occur in this reach have caused bank erosion under Interstate 280 and degradation of the channel bottom throughout the reach. Rock-riprap was placed on the east bank from West Virginia Street bridge to 600 feet upstream to repair erosion that had occurred in 1982.

This reach is well under 1 percent capacity. The river from Interstate 280 to West Virginia Street would flood about every 3 years, and from West Virginia Street upstream the river would flood about every 5 years.

The West Virginia Street bridge crosses this reach. It was built about 1930 and is a reinforced concrete bridge with a center square-nosed pier. It does not have the capacity to convey the 1 percent flow.

Reach 6: Alternatives Considered

The feasible alternatives for this reach are the widened channel and the bypass channel (see Figure 3.3 and Table 3.7). The widened or bypass channel would be constructed to the east due to right of way limitation from the Guadalupe Expressway Corridor (Highway 87). Floodwalls or levees are not feasible in the reach because the channel is significantly under capacity. They would need to be very high to contain the flow.

Widened Gabion Channel with Bench

The east bank would be excavated beginning about 5 feet above the channel invert creating a bench about 90 feet wide. Gabion bank lining and rock bench lining would be required to protect against erosion from the higher flow velocities.

An 18-foot wide depressed maintenance road would be located on the excavated bench. Ramps would be constructed to allow for access from West Virginia Street and Grant Road. No woody growth would be allowed to establish on the excavated bench area.

The West Virginia Street bridge would be replaced to span the widened channel.

The existing west bank and stream channel bottom would not be disturbed. Active erosion existing on the west bank would be repaired with rock, gabions, or other suitable methods according to the maintenance program for erosion repair.

This alternative would require the purchase of 43 properties. It would impact approximately 2.0 acres of riparian and urban forest which would need to be mitigated at a 3:1 ratio[3]. This does not reflect the actual mitigation ratio for loss of vegetation. Off-site mitigation would be needed for 6.0 acres. The estimated cost of this alternative is $18.3 million.

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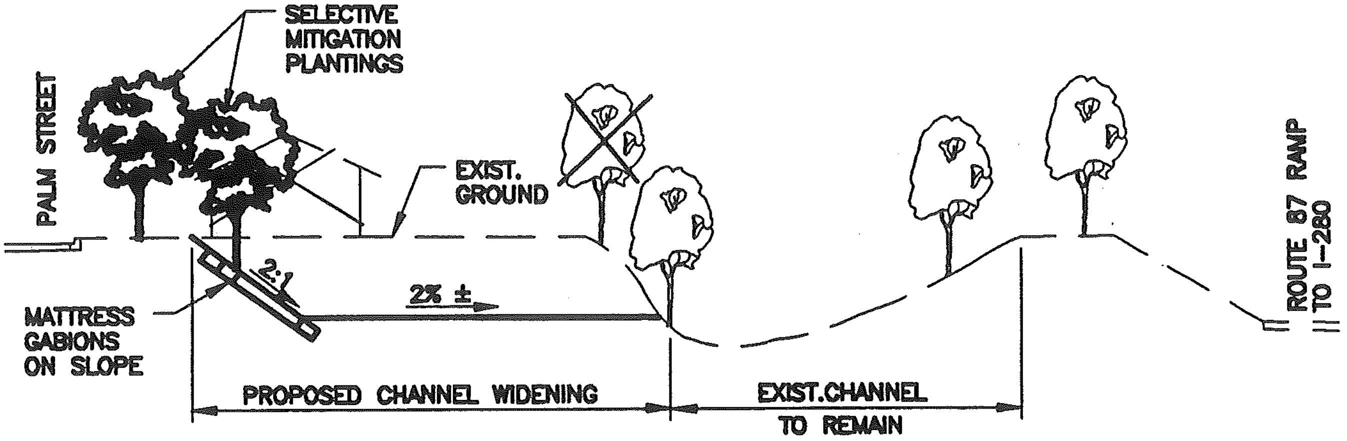
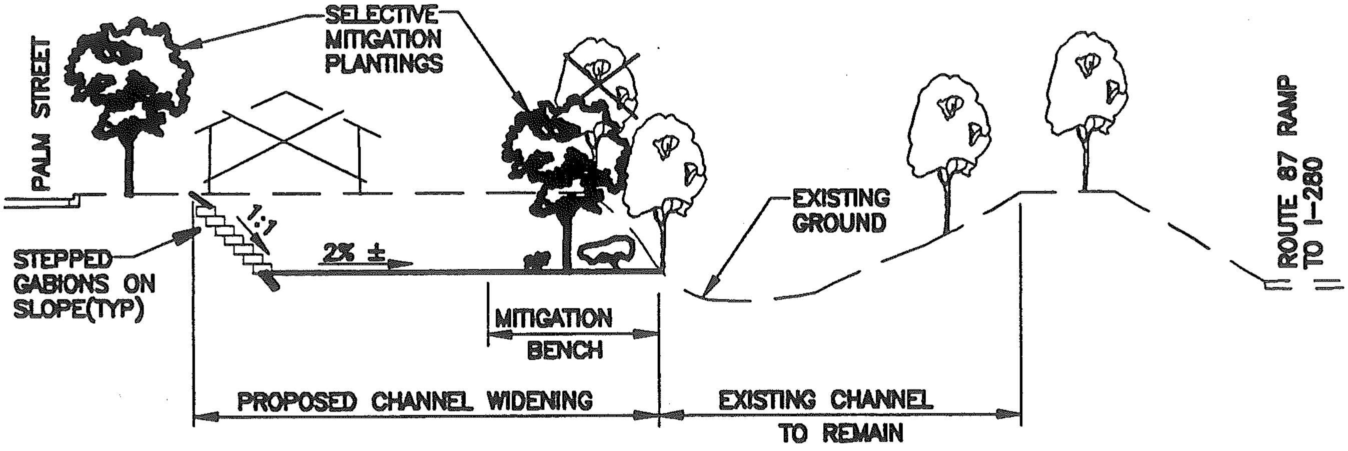
[3] The conservative 3:1 mitigation ratio is solely for cost estimating and comparative purposes.



SELECTIVE MITIGATION PLANTINGS
PALM STREET
EXIST. GROUND
ROUTE 87 RAMP TO I-280
2:1
2% ±
MATTRESS GABIONS ON SLOPE
PROPOSED CHANNEL WIDENING
EXIST.CHANNEL TO REMAIN

WIDENED GABION CHANNEL WITH BENCH

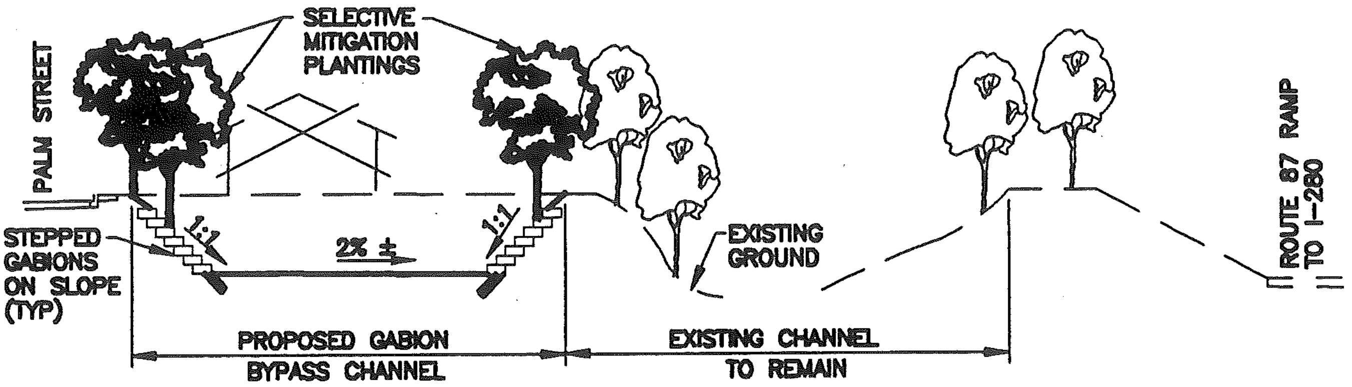


SELECTIVE MITIGATION PLANTINGS
PALM STREET
ROUTE 87 RAMP TO I-280
1:1
2% ±
EXISTING GROUND
STEPPED GABIONS ON SLOPE(TYP)
MITIGATION BENCH
PROPOSED CHANNEL WIDENING
EXISTING CHANNEL TO REMAIN

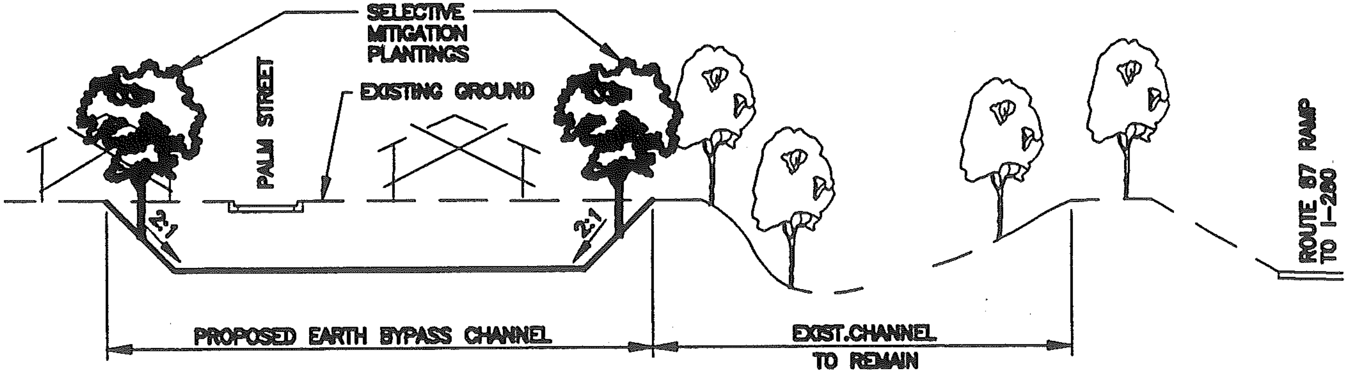
WIDENED GABION CHANNEL WITH MITIGATION BENCH

Figure 3.3
REACH 6 FEASIBLE ALTERNATIVES
TYPICAL SECTIONS

NTS


SELECTIVE MITIGATION PLANTINGS
PALM STREET
STEPPED GABIONS ON SLOPE (TYP)
1:1
2% ±
1:1
EXISTING GROUND
ROUTE 87 RAMP TO I-280
PROPOSED GABION BYPASS CHANNEL
EXISTING CHANNEL TO REMAIN

GABION BYPASS CHANNEL



EARTH BYPASS CHANNEL (EAST BANK ONLY)

Figure 3.3 (cont'd)
REACH 6 FEASIBLE ALTERNATIVES
TYPICAL SECTIONS
NTS

TABLE 3.7
Comparative Summary of Feasible Alternatives, Reach 6—Interstate 280 to SPRR

Issues and Concerns	**Widened Gabion Channel with Bench**	**Widened Gabion Channel with Mitigation Bench**	**Gabion Bypass Channel**	**Earth Bypass Channel**
1.Project Cost				
A. Right of Way	$8.2 million	$8.2 million	$9.8 million	$24.6 million
B. Construction	$5.9 million	$6.0 million	$6.6 million	$7.6 million
C. Mitigation on site	0	$0.2 million	0	$0.3 million
Mitigation off site	$4.2 million	$3.6 million	$0.6 million	0
D. Total Cost	$18.3 million	$18.0 million	$17.0 million	$32.5 million
2. Physical Environment				
A. General Description	East bank bench would be excavated 5 feet above the stream bottom. The remaining lower east bank and west bank would not be disturbed. The excavated east bank would be lined with gabions.	The channel would be excavated the same as the first alternative except, to allow for revegetation on the bench, a steeper gabion-lined bank would be constructed.	The natural stream channel would remain undisturbed except at erosion sites. A gabion bypass channel with rock bottom would be constructed to the east.	The natural stream channel would remain undisturbed except at erosion sites. An earth bypass channel would be constructed to the east.
B. Erosion	Ongoing erosion on the west bank would continue as it has in the past. Depressed bench area subject to possible erosion during high flows.	Ongoing erosion on the west bank would continue as it has in the past. Revegetated bench area subject to possible erosion during high flows.	Existing erosion sites repaired. Decreased erosion in natural stream due to diverted flows.	Existing erosion sites repaired. Decreased erosion in natural stream due to directed flows.
C. Sedimentation	Slight decrease in sedimentation due to east bank gabion lining.	Slight decrease in sedimentation due to east bank gabion lining.	Decrease in sedimentation due to decreased erosion in natural stream.	Decrease in sedimentation due to decreased erosion in natural steam.
D. Water Quality	Slight decrease in turbidity during high flows.	Slight decrease in turbidity during high flows.	Decrease in turbidity due to decreased erosion in natural stream.	Decrease in turbidity due to decreased erosion in natural stream.
E. Maintenance	Access would be improved by constructing a maintenance road on the bench. Moderately intense maintenance due to high velocities. No woody growth would be allowed to establish on proposed bench.	Access would be improved. No maintenance required in the mitigation area. Moderately intense maintenance required elsewhere due to high velocities.	Less intensive maintenance in existing stream. Moderately intense maintenance in the bypass channel.	Less intensive maintenance in existing stream. Moderately intense maintenance in the bypass channel.
3. Biological Environment				
A. Fish Habitat	Loss of upper bank habitat on east bank due to excavation.	Loss of upper bank habitat on east bank due to excavation. Dense revegetation on bench.	Habitat value of natural stream would increase due to decreased in maintenance activities.	Habitat value of natural stream would increase due to decreased in maintenance activities.

TABLE 3.7
Comparative Summary of Feasible Alternatives, Reach 6—Interstate 280 to SPRR
(continued)

Issues and Concerns	Widened Gabion Channel with Bench	Widened Gabion Channel with Mitigation Bench	Gabion Bypass Channel	Earth Bypass Channel
B. Wildlife Habitat	Loss of all east bank vegetation above bench. Bench would remain clear. West bank and lower east bank vegetation would remain. 2.0 acres impact, 6 acres revegetated off site.	Same impacts as first alternative except a portion of the bench would be revegetated. 2.0 acres impact, 0.9 acres revegetated on site, and 5.1 acres revegetated off site.	Habitat value of natural channel would increase over time due to less intensive maintenance. Revegetation on upper banks of bypass channel and top of bank areas. 0.3 acre impact, 0.9 acres revegetated off site.	Habitat value of natural channel would increase over time due to intensive maintenance. Revegetation on bypass channel banks. 0.4 acre impacted. 1.2 acres revegetated on site.
4. Socio-Cultural Environment				
A. Right of Way	Loss of 43 properties.	Loss of 43 properties.	Loss of 54 properties and 1 partial backyard area.	Loss of 100 properties and 3 partial takes.
B. Aesthetics	Would remove riparian vegetation from east bank with some revegetation on upper bank and create open space.	Would remove east bank vegetation but allow for dense revegetation on a portion of the bench and bank and create open space.	Would preserve the natural channel and create open space.	Would preserve and expand natural riparian corridor and create open space.
C. Recreation Potential	Possible linear pathway located on bench.	Possible linear pathway located on bench.	Possible linear pathway located on bottom of bypass channel and on top of the existing east bank.	Possible linear pathway located on bottom of bypass and on top of the existing east bank.

Widened Gabion Channel with Mitigation Bench

This alternative is similar to the Widened Gabion Channel with Bench except that a steeper gabion-lined bank would be constructed to create a wider bench to allow for revegetation.

An 18-foot wide maintenance road would be located on the excavated bench. Ramps would be constructed to allow for access from West Virginia Street. A portion of the bench between the maintenance road and the low-flow channel would be revegetated.

The West Virginia Street bridge would be replaced to span the widened channel.

The existing west bank and stream channel bottom would not be disturbed. Active erosion existing on the west bank would be repaired with rock, gabions, or other suitable methods according to the maintenance program for erosion repair.

This alternative would require the purchase of 43 properties. It would impact approximately 2.0 acres of riparian and urban forest which would need to be mitigated at a 3:1 ratio. Off-site mitigation would be needed for 5.1 acres. The remaining 0.9 acre would be mitigated on site. The estimated cost of this alternative is about $18.0 million.

Gabion Bypass Channel

The bypass channel would be lined with gabions on the banks and has an 85-foot bottom width and 1:1 side slopes.

Maintenance roads would be constructed at both top of banks on the proposed bypass channel. Ramps would be constructed to provide access to the channel bottom.

This alternative would require the removal of McLellan Avenue. A bridge at West Virginia Street would be constructed across the bypass channel.

The existing stream channel would remain undisturbed. Active erosion existing in the natural channel would be repaired with rock, gabions, or other suitable methods according to the maintenance program for erosion repair. The bypass channel would be designed such that low flows would continue in the natural channel.

This alternative would require the purchase of 54 properties and 1 partial backyard area. It would impact approximately 0.3 acres of riparian and urban forest which would need to be mitigated at a 3:1 ratio. Off-site mitigation would be needed for 0.9 acres. The estimated cost of this alternative is about $17.0 million.

Earth Bypass Channel

This alternative is similar to the Gabion Bypass Channel except that the earth bypass channel banks would be sloped at 2:1. Dense revegetation would be possible on the earthen banks.

This alternative would require the removal McLellan Avenue. A bridge at West Virginia Street would be constructed across the bypass channel. Palm Street and Harliss Avenue would be realigned.

The existing stream would remain undisturbed. Active erosion existing in the natural channel would be repaired with rock, gabion, or other suitable methods according to the maintenance program for erosion repair. The bypass channel would be designed such that low flows would continue in the natural channel.

This alternative would require the purchase of 100 properties and 3 partial-takes. It would impact approximately 0.4 acres of riparian and urban forest which would need to be mitigated at a 3:1 ratio. The entire 1.2 acres would be mitigated on-site. The estimated cost for this alternative is about $32.5 million.

Reach 7: SPRR to UPRR

Beginning at the SPRR trestle, the river meanders to the west. It then crosses Willow Street and meanders back to the east. At the Light Rail Transit Tamien Station and County park and ride site, the river remains straight for the remainder of the reach. The existing east bank slopes vary from 1:1 to 2:1 while the west bank is steeper for most of the reach. Because of high velocities, the steep west bank and east bank have experienced erosion and bank sloughing between Willow Street and Alma Avenue. Three erosion sites have been repaired just downstream of Alma Avenue; One sacked concrete repair project on the west bank and two rock repair projects on the east bank.

There are several bridges crossing the river in Reach 7: SPRR trestle, Willow Street bridge, Alma Avenue bridge, and Highway 87 overpass.

The river in this reach is significantly below design capacity. Flooding would occur about every 4 years. Neither the Willow Street bridge nor the Alma Avenue bridge have capacity for the design flow.

Reach 7 is very similar to Reach 6.

Reach 7A: (SPRR to Alma Avenue): Alternatives Considered

The feasible alternatives considered in Reach 7A are channel widening, gabion bypass channel, and earth bypass channel (see Figure 3.4 and Table 3.8).

Widened Gabion Channel with Bench

A transition through the SPRR trestle with a box culvert would be constructed to minimize costly modifications. Upstream of the SPRR trestle to downstream of the Alma Avenue bridge, the east bank would be excavated to create a bench. The proposed bench would be constructed about 5 feet above the existing channel bottom and would be an overflow area. The upper east bank would be lined with gabions at a 1:1 side slope.

FIGURE 3.4
Reach 7A Typical Section - Feasible Alternatives

Figure 3.4 - continued

TABLE 3.8
Comparative Summary of Feasible Alternatives
Reach 7A—SPRR to Alma Avenue

Issues and Concerns	Widened Gabion Channel with Bench	Gabion Bypass Channel	Earth Bypass Channels (East and West Banks)
1. Project Cost			
A. Right of Way	$ 6.7 million	$6.7 million	$13.6 million
B. Construction	$9.0 million	$9.3 million	$6.8 million
C. Mitigation on site	$ 0.0 million	$ 0.0 million	$ 0.5 million
Mitigation off site	$ 6.3 million	$ 0.0 million	$ 0.0 million
D. Total Cost	$22.0 million	$16.0 million	$20.9 million
2. Physical Environment			
A. General Description	East bank would be excavated 5 feet above bottom and lined with gabions.	Natural stream would be undisturbed except at erosion sites. Gabion bypass would be constructed to the east.	Natural stream undisturbed except at erosion sites. Earth bypass channels constructed to the east and west.
B. Erosion	Ongoing erosion on the west bank would continue as it has in the past. Depressed bench area subject to possible erosion during high flows.	Existing erosion sites repaired. Decrease erosion in natural stream due to diverted flows.	Existing erosion sites repaired. Decrease erosion in natural stream due to diverted flows.
C. Sedimentation	Slight decrease in sedimentation due to east bank gabion lining.	Decrease in sedimentation due to decreased in erosion in natural stream.	Decrease in sedimentation due to decreased in erosion in natural stream.
D. Water Quality	Slight decrease in turibity during high flows.	Decrease in turbidity due to decreased erosion in natural stream.	Decrease in turbidity due to decreased erosion in natural stream.
E. Maintenance	Improved access. Moderately intense maintenance due to high velocities. No woody growth would be allowed to establish on proposed bench.	Less intensive maintenance in existing stream. Moderately intense maintenance in bypass channel.	Less intensive maintenance in existing stream. Moderately intense maintenance in bypass channels. Less erosion repair.
3. Biological Environment			
A. Fish Habitat	Loss of upper bank habitat on east bank due to excavation.	Habitat value of natural stream would increase due to decreased in maintenance activities.	Habitat value of natural stream would increase due to decreased in maintenance activities.
B. Wildlife Habitat	Loss of most vegetation on east bank. 3.0 acres impact, 9.0 acres revegetation off site.	Habitat value in existing stream would increase over time due to less intensive maintenance. Some revegetation on banks. No significant habitat impacted.	Habitat value in existing stream would increase over time due to less intensive maintenance and expanded riparian corridor. Revegetation on bypass channel banks. 0.8 acres impact, 2.4 acres revegetation on site.
4. Socio-Cultural Environment			
A. Right of Way	Relocation of 13 commercial businesses.	Relocation of 13 commercial businesses.	Loss of 23 properties and relocation of 13 commercial businesses.
B. Aesthetics	Would remove riparian vegetation from east bank and create open space.	Would preserve natural channel and create open space.	Would preserve and expand natural riparian corridor, provide buffer between natural channel and development as per recommendations in City's Riparian Corridor Policy Study, and create open space.
C. Recreation Potential	Possible linear path along maintenance road on bench.	Possible linear pathway on bottom of bypass and top of existing east bank.	Possible linear pathway on both east and west top of banks of the natural channel.

The existing west bank and stream channel bottom would not be disturbed. Active erosion existing on the west bank would be repaired with rock, gabions, or other suitable method according to the maintenance program for erosion repair.

Eighteen-foot wide maintenance roads would be constructed at the top of the bank and on the excavated bench. Ramps would be constructed to provide for access between the two maintenance roads. No woody growth would be allowed to establish on the excavated bench area.

The Willow Street bridge would be replaced to span the widened channel.

This alternative would require the relocation of 13 commercial businesses. It would impact 3.0 acres of riparian and urban forest which would need to be mitigated at a 3:1 ratio. Off-site mitigation would be needed for 9 acres. The estimated cost of this alternative is $22.0 million.

Gabion Bypass Channel

A bypass trapezoidal gabion-lined channel to carry peak flood flows would be constructed to the east of the existing river. The bypass channel would be lined with gabions on the banks at a 1:1 side slope and have a 50-foot bottom width (see Figure 3.4 and Table 3.8). A bypass culvert would be built under the SPRR tracks.

A new bridge would be constructed at Willow Street to span the bypass channel.

Maintenance roads would be constructed at both top of banks of the proposed bypass channel. Ramps would be constructed to provide access to the bottom of the proposed channel.

Vegetation would be preserved in the existing channel. Active erosion existing in the natural channel would be repaired with rock, gabions, or other suitable methods according to the maintenance program for erosion repair. The bypass channel would be designed such that low flows would continue in the natural channel.

This alternative would require the relocation of 13 commercial businesses. There is no significant impact to the riparian vegetation with this alternative. The cost estimate of this alternative is $16.0 million.

Earth Bypass Channels (East and West Banks)

Earth bypass channels would be constructed both to the east and west of the natural channel and the channel banks would have 2:1 side slopes (see Figure 3.4 and Table 3.8).

Bridges would be constructed at Willow Street and Alma Avenue to span the bypass channel. Ramps would be provided for access into the bypass channels.

The natural channel banks would not be disturbed except at erosion sites. Active erosion existing in the natural channel would be repaired with rock, gabions, or other suitable methods according to the maintenance program for erosion repair. Revegetation would be provided on both the east and west banks of the bypass channels. Maintenance roads would be located on both the east and west top of banks of the natural channel. The bypass channels would be designed such that low flows would continue in the natural channel.

This alternative would require the purchase of 23 properties and the relocation of 13 commercial businesses. It would impact approximately 0.8 acres of riparian and urban forest which would need to be mitigated at a 3:1 ratio. The entire 2.4 acre would be mitigated on site. The estimated cost of this alternative is $20.9 million.

Reach 7B: (Alma Avenue to UPRR): Alternative Considered

The feasible alternatives considered in Reach 7B are channel widening and bypass channel (See Figure 3.5 and Table 3.9). Alternatives to construct only a floodwall on Elk's Lodge property or to purchase the entire Elk's Lodge property for peak reducing detention pond were evaluated but were found infeasible because they will increase the project cost. The floodwall alternative will require a 10-feet high floodwall be placed at where the existing Elk's Lodge building is located and a larger bypass channel be constructed upstream and downstream of the Elk's Lodge property. The peak reducing detention pond alternative would only reduce the peak of the 1 percent flood flow by a few minutes. As floods usually last longer than a few minutes, construction of a detention pond in the entire Elk's Lodge property will not reduce the flood flows.

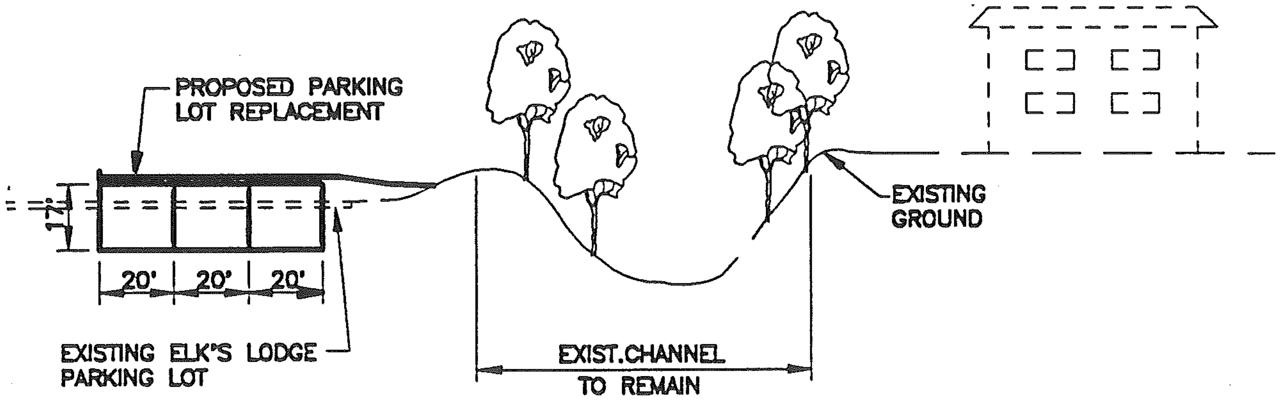
Widened Gabion Channel with Bench

Upstream of Alma Street to downstream of UPRR bridge, the east bank would be excavated to create a bench. The proposed bench would be constructed about 5 feet above the existing channel bottom and would be an overflow area. The upper east bank would be lined with gabions at a 1:1 side slope. The Alma Street bridge would be replaced to span the widened channel.

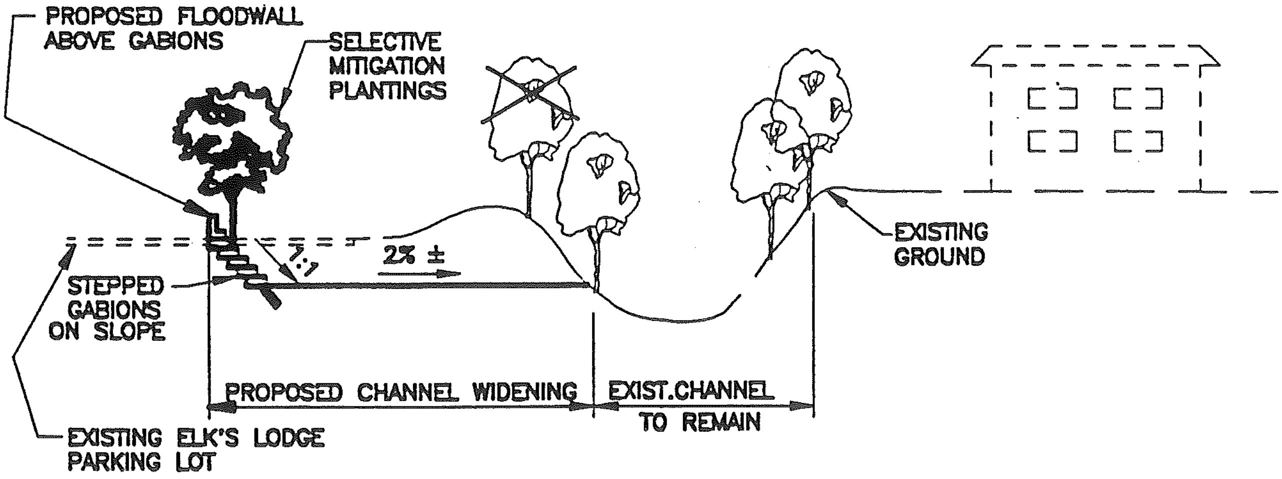
The existing west bank and stream channel bottom would not be disturbed. Active erosion existing on the west bank would be repaired with rocks, gabions, or other suitable method according to the maintenance program for erosion repair.

Eighteen-foot wide maintenance roads would be constructed at the top of the bank and on the excavated bench. Ramps would be constructed to provide for access between the two maintenance roads. No woody growth would be allowed to established on the excavated bench area.

This alternative would require acquisition of a portion of the land owned by the Elk's Lodge. A portion of the existing parking space would be relocated in coordination with the Elk's Lodge. This alternative would impact 0.8 acres of riparian and urban forest which would need to be mitigated at a 3:1 ratio. Off-site mitigation would be needed for 2.4 acres. The estimated cost of this alternative is $5.5 million.


PROPOSED PARKING LOT REPLACEMENT
17'
20'
20'
20'
EXISTING ELK'S LODGE PARKING LOT
EXIST.CHANNEL TO REMAIN
EXISTING GROUND

REINFORCED CONCRETE BYPASS CHANNEL


PROPOSED FLOODWALL ABOVE GABIONS
SELECTIVE MITIGATION PLANTINGS
2:1
2% ±
STEPPED GABIONS ON SLOPE
PROPOSED CHANNEL WIDENING
EXIST.CHANNEL TO REMAIN
EXISTING ELK'S LODGE PARKING LOT
EXISTING GROUND

WIDENED GABION CHANNEL WITH BENCH

Figure 3.5

REACH 7B FEASIBLE ALTERNATIVES

TYPICAL SECTIONS

NTS

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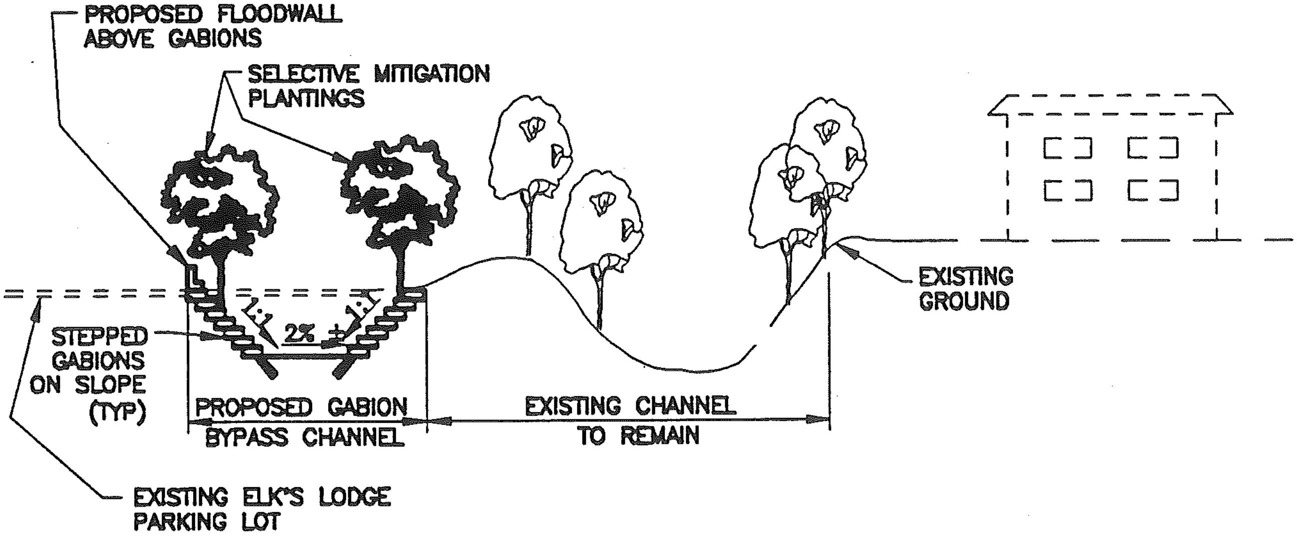
PROPOSED FLOODWALL ABOVE GABIONS
SELECTIVE MITIGATION PLANTINGS
1:1
2% ±
1:1
STEPPED GABIONS ON SLOPE (TYP)
PROPOSED GABION BYPASS CHANNEL
EXISTING CHANNEL TO REMAIN
EXISTING GROUND
EXISTING ELK'S LODGE PARKING LOT

GABION BYPASS CHANNEL

Figure 3.5 (cont'd)

REACH 7B FEASIBLE ALTERNATIVES

TYPICAL SECTIONS

NTS

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TABLE 3.9
Comparative Summary of Feasible Alternatives
Reach 7B—Alma Avenue to UPRR

Issues and Concerns	Widened Gabion Channel with Bench	Gabion Bypass Channel	Covered Bypass Channel
1. Project Cost			
A. Right of Way	$ 0.9 million	$1.3 million	$ 0.6 million
B. Construction	$2.9 million	$3.0 million	$8.4 million
C. Mitigation on site	$ 0.0 million	$ 0.0 million	$ 0.0 million
Mitigation off site	$ 1.7 million	$ 0.0 million	$ 0.0 million
D. Total Cost	$5.5 million	$4.3 million	$9.0 million
2. Physical Environment			
A. General Description	East bank would be excavated 5 feet above bottom and lined with gabions.	Natural stream would be undisturbed except at erosion sites. Gabion bypass would be constructed to the east.	A triple 20 by 17-foot box culvert would be constructed.
B. Erosion	Ongoing erosion on the west bank would continue as it has in the past. Depressed bench area subject to possible erosion during high flows.	Existing erosion sites repaired. Decrease erosion in natural stream due to diverted flows.	Existing erosion sites repaired. Decrease erosion in natural stream due to diverted flows.
C. Sedimentation	Slight decrease in sedimentation due to east bank gabion lining.	Decrease in sedimentation due to decreased in erosion in natural stream.	Decrease in sedimentation due to decreased in erosion in natural stream.
D. Water Quality	Slight decrease in turibity during high flows.	Decrease in turbidity due to decreased erosion in natural stream.	Decrease in turbidity due to decreased erosion in natural stream.
E. Maintenance	Improved access. Moderately intense maintenance due to high velocities. No woody growth would be allowed to establish on proposed bench.	Less intensive maintenance in existing stream. Moderately intense maintenance in bypass channel.	Less intensive maintenance in existing stream. Moderately intense maintenance in bypass channel.
3. Biological Environment			
A. Fish Habitat	Loss of upper bank habitat on east bank due to excavation.	Habitat value of natural stream would increase due to decreased in maintenance activities.	Habitat value of natural stream would increase due to decreased maintenance activities
B. Wildlife Habitat	Loss of most vegetation on east bank. 3.0 acres impact, 9.0 acres revegetation off site.	Habitat value in existing stream would increase over time due to less intensive maintenance. Some revegetation on banks. No significant habitat impacted.	Habitat value in existing stream would increase over time due to less intensive maintenance. Some revegetation on banks. No significant habitat impacted.
4. Socio-Cultural Environment			
A. Right of Way	Acquisition of portions of Elk's Lodge property.	Acquisition of portions of Elk's Lodge property.	Easement on Elk's Lodge.
B. Aesthetics	Would remove riparian vegetation from east bank and create open space.	Would preserve natural channel and create open space.	Would preserve natural channel and create open space. Top of culvert would be used for parking.
C. Recreation Potential	Possible linear path along maintenance road on bench.	Possible linear pathway on bottom of bypass and top of existing east bank.	Possible linear pathway on bottom of bypass and top of existing east bank.

Gabion Bypass Channel

A bypass trapezoidal gabion-lined channel to carry peak flood flows would be contructed to the east of the existing river. The bypass channel would be lined with gabions on the banks at a 1:1 sideslope and have a 80-foot bottom width (see Figure 3.5 and Table 3.9). A new bridge would be contructed at the Alma Street bridge.

Maintenance roads would be contructed at both top of banks of the proposed bypass channel. Ramps would be constructed to provide access to the bottom of the bypass channel.

Vegetation would be preserved in the existing channel. Active erosion existing in the natural channel would be repaired with rocks, gabions, or other siuitable methods according to the maintenance program for erosion repair. The bypass channel would be designed such that low flows would continue in the natural channel.

This alternative would require acquisition of a portion of the land owned by the Elk's Lodge. A portion of the existing parking space would be relocated in coordination with the Elk's Lodge. There is no significant impact to the riparian vegetation with this alternative. The cost estimate of this alternaitve is $4.3 million.

Covered Bypass Channel

A covered bypass channel would be constructed on the same alignment as previously described in the gabion bypass alternative. The covered bypass channel would consists of a triple 20- by 17-foot reinforced concrete box culvert (see Figure 3.5 and Table 3.9). This alternative would require the least amont of right of way but the construction cost would be very high. The Elk's Lodge parking lot would be replaced on top of the proposed culvert. A culvert would be contructed at the Alma Street bridge.

Maintenance access would be from both ends of the culvert. An 18-foot maintenance road would be located on top of the box culvert.

Vegetation would be preserved in the existing channel. Active erosion existing in the natural channel would be repaired with rocks, gabions, or other siuitable methods according to the maintenance program for erosion repair. The bypass channel would be designed such that low flows would continue in the natural channel.

This alternative would require acquisition of an easement from the Elk's Lodge. There is no significant impact to the biotic environment with this alternative. The cost estimate of this alternaitve is $9.0 million.

Reach 8: UPRR to Willow Glen Way

The existing river is straight in this reach with side slopes about 1½ to 1. The District has acquired maintenance easement along the west bank and a small portion of the east bank near UPRR for erosion repair projects and for maintenance access.

High velocities occur in this reach during moderate flow and have caused bank and bed erosion problems. About 600 feet of the west bank has been repaired with sacked concrete including a site near Willow Glen Way that was completed in 1986. Modification to a sewer siphon was done when it was exposed by bed erosion just upstream of UPRR.

The only structure crossing the river in this reach is the UPRR trestle. The trestle is a clear span steel girder structure with vertical abutments.

The channel is significantly below the 1 percent design flow capacity. Flooding could occur over the east bank about every 9 years in this reach. The UPRR trestle only has capacity for an 11-year frequency flow.

Reach 8: Alternatives Considered

The alternatives considered feasible in this reach are widened gabion, gabion bypass, and earth bypass channels (see Figure 3.6 and Table 3.10). The covered bypass alternative is eliminated due to high cost.

Widened Gabion Channel with Mitigation Bench

An excavated bench 5 feet above the channel invert would be constructed to the east and would be partially revegetated. The bank would be lined with gabions.

The existing maintenance road and concrete ramp along the west bank would provide access to the existing channel. Along the excavated east bank, an 18-foot maintenance road on the top of east bank and a depressed maintenance road at the toe of bank would be constructed for access.

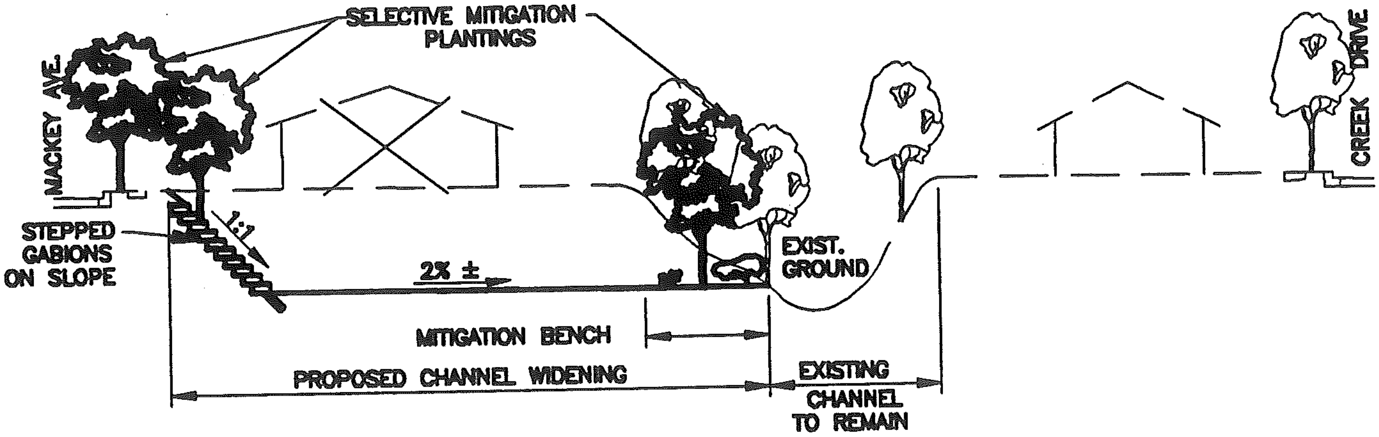
The UPRR trestle would be replaced to span the widened channel.

Vegetation on the east bank would be removed above the elevation of the bench. The existing west bank and the remainder of the east bank would be preserved. Portion of the proposed bench would be revegetated. Active erosion existing on the west bank would be repaired with rock, gabions, or other suitable methods according to the maintenance program for erosion repair.

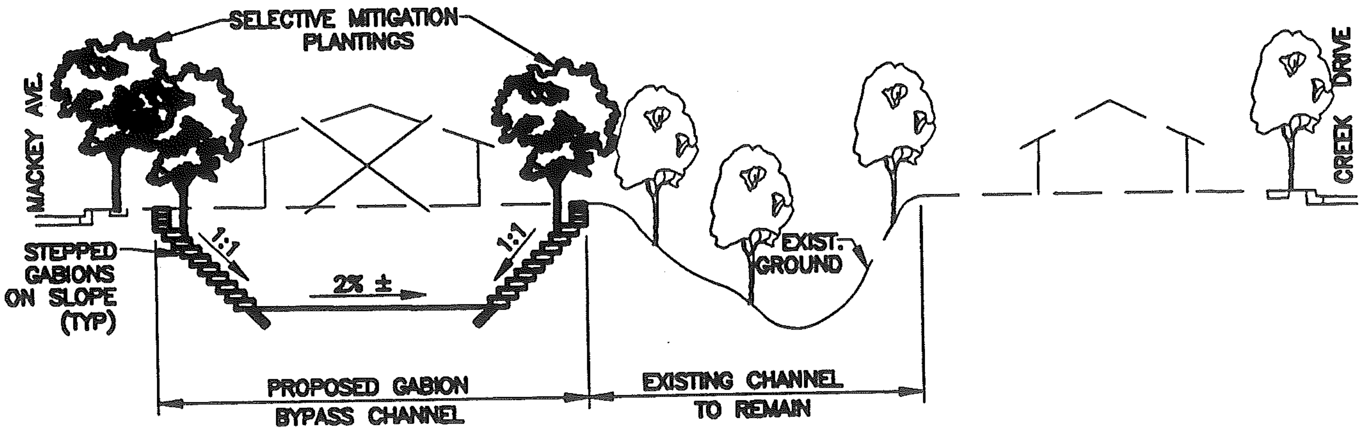
This alternative would require the purchase of 23 properties. It would impact approximately 0.9 acres of riparian and urban forest which would need to be mitigated at a 3:1 ratio. Off-site mitigation would be needed for 2.1 acres. The estimated cost of this alternative is $10.5 million.

Gabion Bypass Channel

A bypass trapezoidal gabion channel would be constructed to the east of the existing river. The bypass channel would be lined with gabions on the banks at a slope of 1:1 and have an 85-foot bottom width.



WIDENED GABION CHANNEL WITH MITIGATION BENCH


SELECTIVE MITIGATION PLANTINGS
MACKEY AVE.
CREEK DRIVE
STEPPED GABIONS ON SLOPE (TYP)
1:1
1:1
2% ±
EXIST. GROUND
PROPOSED GABION BYPASS CHANNEL
EXISTING CHANNEL TO REMAIN

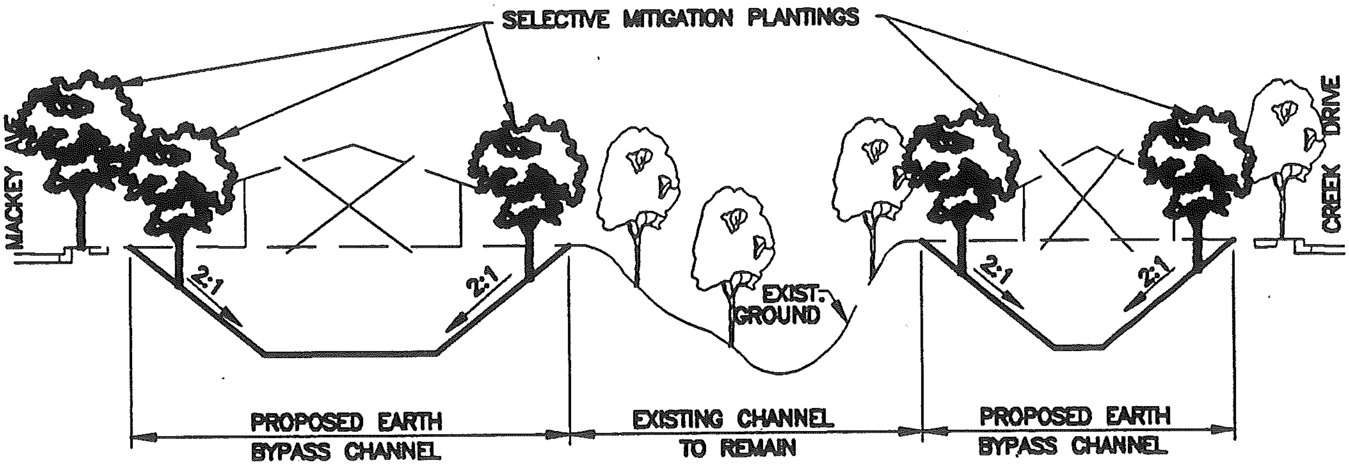
GABION BYPASS CHANNEL

Figure 3.6

REACH 8 FEASIBLE ALTERNATIVES

TYPICAL SECTIONS

NTS


SELECTIVE MITIGATION PLANTINGS
MACKEY AVE
CREEK DRIVE
2:1
2:1
EXIST. GROUND
2:1
2:1
PROPOSED EARTH BYPASS CHANNEL
EXISTING CHANNEL TO REMAIN
PROPOSED EARTH BYPASS CHANNEL

EARTH BYPASS CHANNELS
(EAST AND WEST BANKS)

Figure 3.6 (cont'd)
REACH 8 FEASIBLE ALTERNATIVES
TYPICAL SECTIONS
NTS

TABLE 3.10
Comparative Summary of Feasible Alternatives
Reach 8—UPRR to Willow Glen Way

Issues and Concerns	Widened Gabion Channel with Mitigation Bench	Gabion Bypass Channel	Earth Bypass Channels (East and West Banks)
1. Project Cost			
A. Right of Way	$ 4.8 million	$ 4.8 million	$10.2 million
B. Construction	$ 4.1 million	$ 4.3 million	$ 3.5 million
C. Mitigation on site	$ 0.1 million	$ 0.0 million	$ 0.5 million
Mitigation off site	$ 1.5 million	$ 0.6 million	$ 0.0 million
D. Total Cost	$10.5 million	$ 9.7 million	$14.2 million
2. Physical Environment			
A. General Description	East bank would be excavated 5 feet above stream bottom and bank would be lined with gabions. Earth bench and gabion bank would be partially revegetated.	Natural stream channel would be undisturbed except at erosion sites. Parallel bypass channel to the east with gabion banks would be constructed.	Natural stream undisturbed except at erosion sites. Earth bypass channels would be constructed to the east and west.
B. Erosion	Ongoing erosion on the west bank would continue as it has in the past. Revegetated bench area subject to possible erosion during high flows.	Existing erosion sites repaired. Decrease erosion in natural stream due to diverted flows.	Existing erosion sites repaired. Decrease erosion in natural stream due to diverted flows.
C. Sedimentation	Slight decrease in sedimentation due to east bank gabion lining.	Decrease in sedimentation due to decreased in erosion in natural stream.	Decrease in sedimentation due to decreased in erosion in natural stream.
D. Water Quality	Slight decrease in turbidity during high flows.	Decrease in turbidity due to decreased erosion in natural stream.	Decrease in turbidity due to decreased erosion in natural stream.
E. Maintenance	Improved access and less intensive maintenance.	Less intensive maintenance in the natural channel and moderately intense maintenance in the bypass due to sedimentation/erosion. Access to existing stream improved.	Less intensive maintenance in existing stream. Moderately intense maintenance in bypass channels.
3. Biological Environment			
A. Fish Habitat	Loss of upper bank habitat on east bank due to excavation. Dense revegetation on bench.	Habitat value of natural stream would increase due to decreased in maintenance activities.	Habitat value of natural stream would increase due to decreased in maintenance activities.
C. Wildlife Habitat	Loss of upper east bank vegetation. Dense revegetation on a portion of the bench. 0.9 acre impact, 0.6 acres revegetated on site, and 2.1 acres revegetated off site.	Habitat value in natural stream would improve due to less intensive maintenance. Loss of vegetation at diversion structure site. 0.3 acres impact, 0.9 acres revegetated off site.	Habitat value in existing stream would increase over time due to less intensive maintenance and expanded riparian corridor. Revegetation on bypass channel banks. 0.8 acres impact, 2.5 acres of revegetated on site.
4. Socio-Cultural Environment			
A. Right of Way	Loss of 23 properties. Right-of-way width of 220 feet.	Loss of 23 properties. Right-of-way width of 220 feet.	Loss of 41 properties.
B. Aesthetics	Would remove existing riparian vegetation on east bank, allow for some dense planting areas on bench, and create open space.	Would preserve natural riparian habitat and create open space.	Would preserve and expand natural riparian corridor, provide buffer between natural channel and development as per recommendation in City's Riparian Corridor Policy Study,and create open space.
C. Recreation Potential	Possible linear pathway on top of bank adjacent to Mackey Avenue.	Possible linear pathway on top of bank adjacent to Mackey Avenue.	Possible linear pathway on both east and west top of banks of the natural channel.

Maintenance access to the bypass would be provided by ramps located on the east bank of the bypass channel. Access to the river would be from the existing west bank maintenance road and ramp.

A triple 17- by 20-foot bypass culvert would be constructed at the UPRR trestle.

Vegetation in the existing river would be undisturbed except at erosion sites. Active erosion existing in the natural channel would be repaired with rock, gabions, or other suitable methods according to the maintenance program for erosion repair. The bypass channel would be designed such that low flows would continue in the natural channel.

This alternative would require the purchase of 23 properties. It would impact approximately 0.3 acres of riparian and urban forest which would need to be mitigated at a 3:1 ratio. Off-site mitigation would be needed for 0.9 acres. The estimated cost of this alternative is $9.7 million.

Earth Bypass Channels (East and West Banks)

Earth bypass channels would be constructed both to the east and west of the natural channel and the channel banks would have 2:1 side slopes.

Maintenance roads would be located on both the east and west top of banks of the natural channel.

Culverts would be constructed at UPRR to span the bypass channels. Ramps would be provided for access into the bypass channels.

The natural channel banks would be undisturbed except at erosion sites. Active erosion existing in the natural channel would be repaired with rock, gabions, or other suitable methods according to the maintenance program for erosion repair. Revegetation would be provided on both the east and west banks of the bypass channels. The bypass channels would be designed such that low flows would continue in the natural channel.

This alternative would require the purchase of 41 properties. It would impact approximately 0.8 acres of riparian and urban forest which would need to be mitigated at a 3:1 ratio. The estimated cost of this alternative is $14.2 million.

Reach 9: Willow Glen Way to Curtner Avenue

In this reach, the Guadalupe River is a deep meandering channel with slopes steeper than 1:1. Almaden Road runs parallel to the east bank of this reach and homes exist along the west bank. This reach is mostly privately owned except in areas where the District has flood control easements to repair bank erosion.

The channel is below the 1 percent design flow capacity. Narrow channel sections exist at several locations in this reach creating hydraulic constrictions which will cause overbanking and high-flow velocities. Backwater effects from Reach 9 will extend upstream to Reach 10A and impact Canoas Creek.

Erosion has been and will continue to be a problem in this reach. During moderate flows, erosive velocities occur throughout the reach. About 1,400 feet of bank erosion has been repaired by the District using sacked concrete. Several property owners have built their own erosion protection measures. Other active erosion sites have been identified and may eventually require repair.

The two existing bridges crossing the river are Willow Glen Way bridge and Malone Road bridge. Willow Glen Way bridge, built in 1916, is one of the earliest reinforced concrete bridges. It was constructed with vertical abutments and one center pier. A clear span steel pedestrian bridge is located on the south side of the bridge. Malone Road bridge was a reinforced concrete structure. This bridge has been replaced by the City in 1989 and was built with a vertical abutment to increase flow carrying capacity.

In earlier studies in 1970 by the Corps, floodwalls were the only alternative identified for Reach 9. After considerable public opposition to floodwalls, an off-stream storage alternative was investigated as described in the previous section. This alternative, although supported by residents in Reach 9, was not feasible and was eliminated from further consideration.

Reach 9: Alternatives Considered

The feasible alternatives considered for Reach 9 are channel widening, covered bypass channel, and earth bypass channel (see Figure 3.7 and Table 3.11).

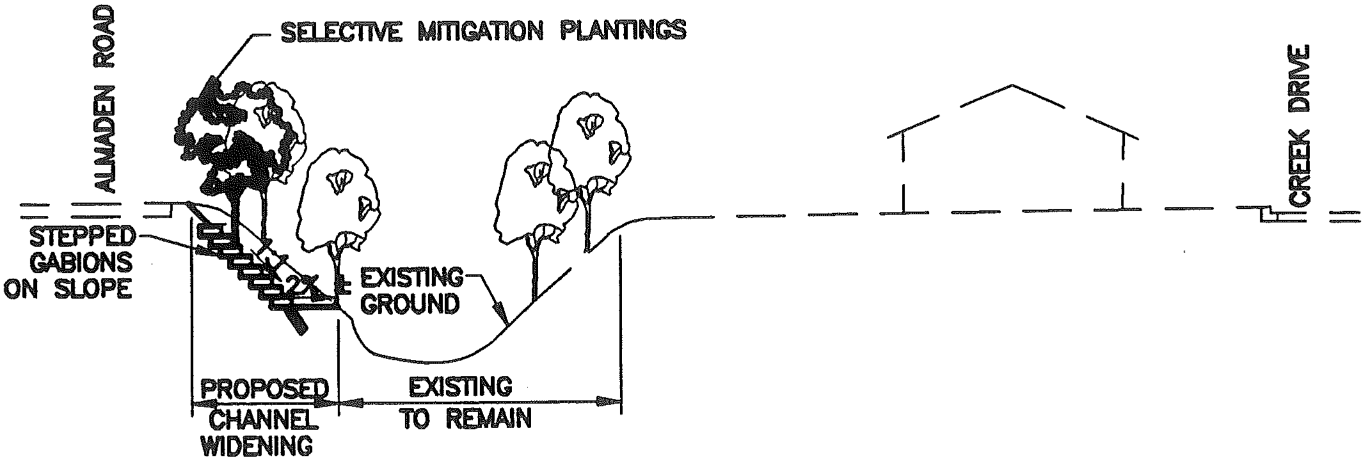
Widened Gabion Channel with Bench

This alternative proposed widening of the east bank with a depressed bench. The bench would be constructed 5 to 10 feet above the natural stream bottom. The bench would vary from 15 to 60 feet in width. Short bypass channels would be constructed to preserve existing vegetation on the existing bank near the end of Guadalupe Avenue and upstream of Malone Road. The natural bank and vegetation between the channel bottom and the proposed bench elevation would be preserved where possible.

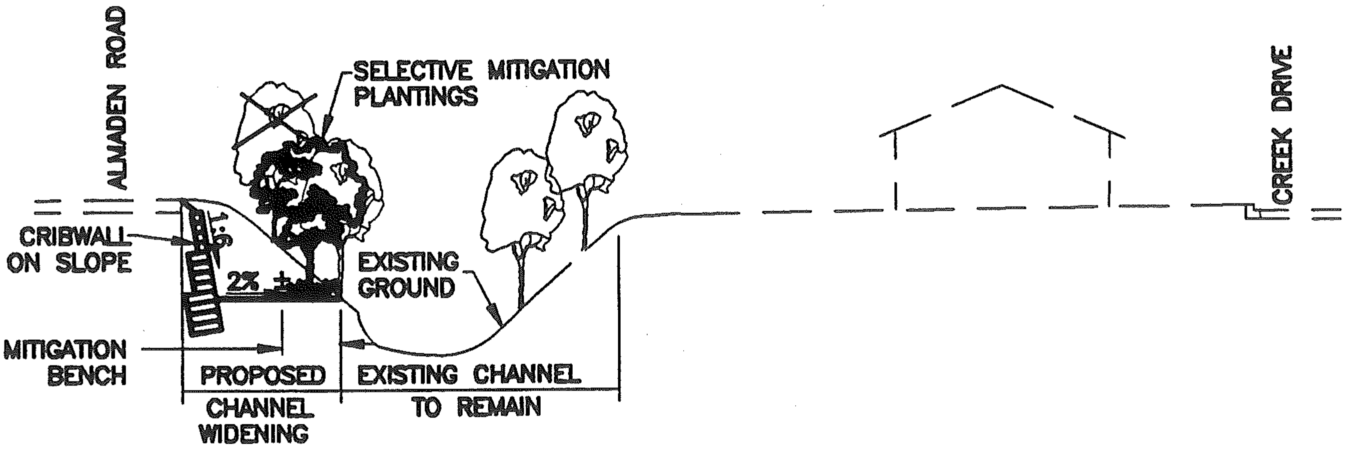
An 18-foot maintenance road would be constructed on the proposed bench. No woody growth would be allowed to establish on the proposed bench. Maintenance access ramps from the proposed bench road to the channel bottom would be constructed at several locations throughout the reach.

A new bridge would be constructed at Willow Glen Way to span the widened gabion channel.

The existing west bank and stream bottom would not be disturbed. Active erosion existing on the west bank would be repaired with rock, gabions, or other suitable methods according to the maintenance program for erosion repair.



WIDENED GABION CHANNEL WITH BENCH


ALMADEN ROAD
SELECTIVE MITIGATION PLANTINGS
CREEK DRIVE
CRIBWALL ON SLOPE
1:6
2% ±
EXISTING GROUND
MITIGATION BENCH
PROPOSED CHANNEL WIDENING
EXISTING CHANNEL TO REMAIN

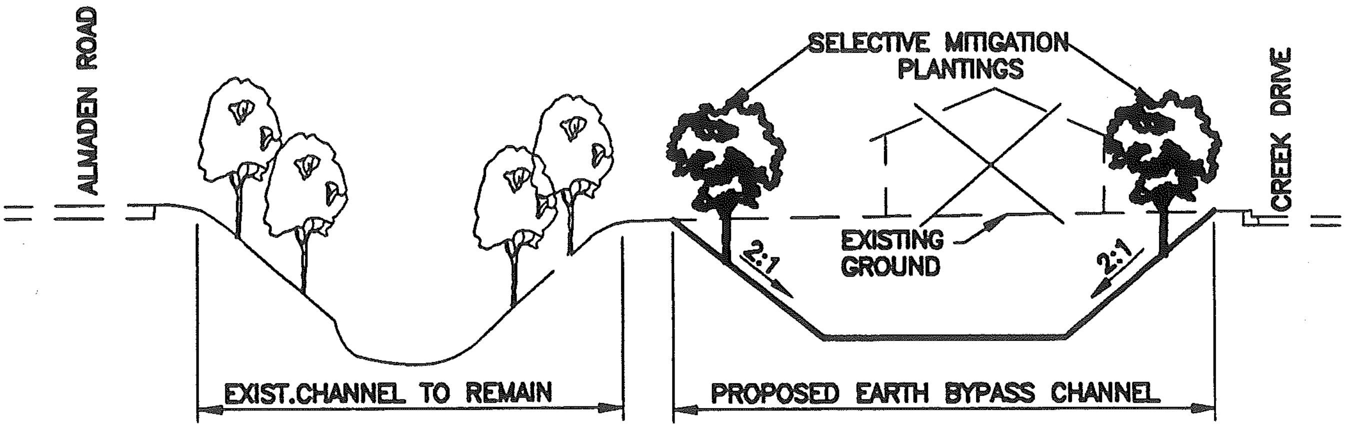
WIDENED CRIBWALL CHANNEL WITH MITIGATION BENCH

Figure 3.7

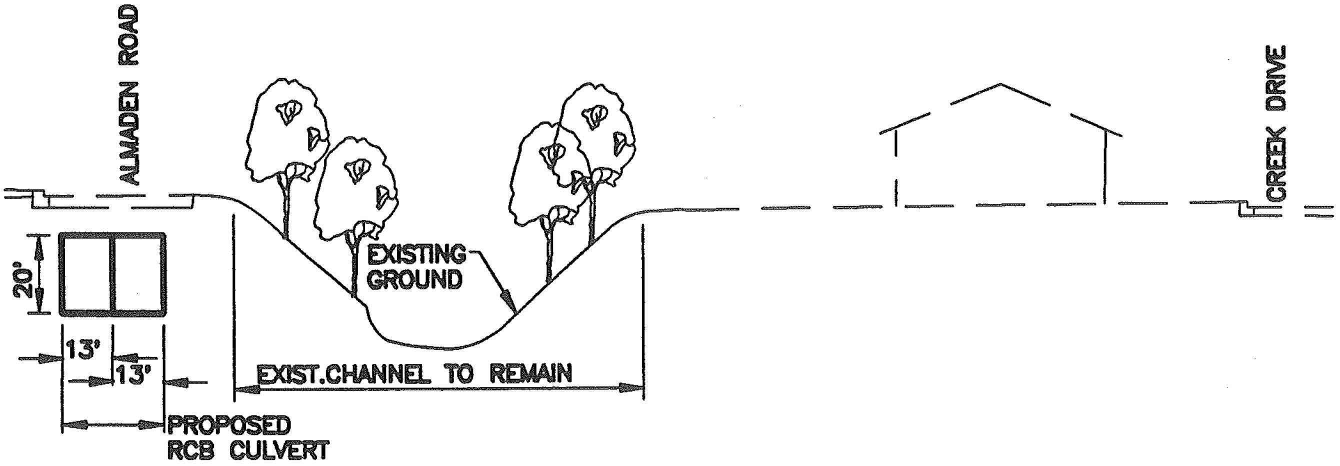
REACH 9 FEASIBLE ALTERNATIVES

TYPICAL SECTIONS

NTS



WEST BANK EARTH BYPASS CHANNEL



COVERED BYPASS CHANNEL

Figure 3.7 (cont'd)

REACH 9 FEASIBLE ALTERNATIVES

TYPICAL SECTIONS

NTS

TABLE 3.11
Comparative Summary of Feasible Alternative, Reach 9—Willow Glen Way to Curtner Avenue

Issues and Concerns	Widened Gabion Channel with Bench	Widened Cribwall Channel with Mitigation Bench	West Bank Earth Bypass Channel	Covered Bypass Channel
1. Project Cost				
A. Right of Way	$ 3.9 million	$ 3.9 million	$21.9 million	$ 3.1 million
B. Construction	$ 7.5 million	$10.0 million	$ 4.1 million	$48.4 million
C. Mitigation on site	$ 0.0 million	$ 0.2 million	$ 0.0 million	$ 0.0 million
Mitigation off site	$ 7.1 million	$ 6.5 million	$ 0.0 million	$ 1.5 million
D. Total Cost	$18.5 million	$20.6 million	$26.0 million	$53.0 million
2. Physical Environment				
A. General Description	East bank of natural stream would be excavated 5 to 10 feet above the stream bottom and lined with gabions. Two short bypass channels would be created to preserve vegetation.	East bank of natural stream would be excavated 5 to 10 feet above the stream bottom and lined with cribwall. Revegetation would be provided on bench. Two short bypass channels would be created.	Natural stream would be undisturbed except at erosion sites. Earth bypass channel would be constructed to the west.	A double 13- by 20-foot bypass box culvert to carry 5,000 cfs downstream would be constructed to the east under Almaden Road. Natural stream to remain undisturbed except at erosion repair sites and at the confluence of the bypass and natural stream.
B. Erosion	Ongoing erosion on the west bank to continue as it has in the past. Depressed bench area subject to possible erosion during high flows.	Ongoing erosion on the west bank to continue as it has in the past. Revegetated bench area subject to possible erosion during high flows.	Existing erosion sites repaired. Decrease erosion in natural stream due to diverted flows.	Existing erosion sites repaired. Decrease erosion in natural stream due to diverted flows.
C. Sedimentation	Slight decrease in sedimentation due to east bank gabion lining.	Slight decrease in sedimentation due to east bank gabion lining.	Decrease in sedimentation due to decreased in erosion in natural stream.	Decrease in sedimentation due to decreased in erosion in natural stream.
D. Water Quality	Slight decrease in turbidity during high flow.	Slight decrease in turbidity during high flows.	Decrease in turbidity due to decreased erosion in natural stream.	Decrease in turbidity due to decreased erosion in natural stream.
E. Maintenance	Improved access from the maintenance road located on bench. Less intensive maintenance required in natural channel and revegetation areas. No woody growth would be allowed to establish on proposed bench.	Improved access from the maintenance road on bench. Less intensive maintenance required in natural channel. No maintenance required in mitigation area.	Less intensive maintenance in existing stream. Moderately intense maintenance in bypass channel.	Access to natural channel would not improve but natural channel would have less intensive maintenance. Less intensive maintenance required in bypass culvert but access would be difficult.
3. Biological Environment				
A. Fish Habitat	Loss of upper bank habitat on east bank due to excavation.	Loss of upper bank habitat on east bank due to excavation. Dense revegetation on bench.	Habitat value of natural stream would increase due to decreased in maintenance activities.	Habitat value of natural stream would increase due to decreased in maintenance activities.
B. Wildlife Habitat	Loss of upper portion of east bank habitat except at bypass areas. Loss of vegetation at erosion sites. Revegetation on upper east bank. 3.4 acres impacted, 10.2 acres revegetated off site.	Loss of upper portion of east bank habitat except at bypass areas. Loss of west bank vegetation of erosion sites. Dense revegetation on portion of bench. 3.4 acres impacted, 0.9 acres revegetated on site, and 9.3 acres revegetated off site.	Habitat value in existing stream would increase over time due to less intensive maintenance. Revegetation on bypass channel banks. No significant impact. Loss of some urban forest.	Habitat value of natural stream would increase over time due to less intensive maintenance. Loss of vegetation at erosion repair sites and at bypass junction. 0.7 acre impacted, 2.1 acres revegetated off site.

TABLE 3.11
Comparative Summary of Feasible Alternatives
Reach 9—Willow Glen Way to Curtner Avenue
(continued)

Issues and Concerns	Widened Gabion Channel with Bench	Widened Cribwall Channel with Mitigation Bench	West Bank Earth Bypass Channel	Covered Bypass Channel
4. Socio-Cultural Environment				
A. Right of Way	Loss of six properties, two partial backyard areas, and two businesses, portions of SJWC sites, and acquisition of easements	Loss of six properties, two partial backyard areas, two businesses, portions of SJWC sites, and acquisition of easements on west bank.	Loss of 73 properties.	Loss of ten properties, two businesses, portions of SJWC sites, and acquisition of easements on west bank.
B. Aesthetics	Would remove riparian vegetation from upper east bank.	Would remove riparian vegetation from upper east bank.	Would preserve the natural channel and create open space.	Would preserve the natural channel.
C. Recreation Potential	Possible linear path along bench and Almaden Road.	Possible linear path along bench and Almaden Road.	Possible linear pathway on top of banks of the natural channel.	No change. Poor access, path would be located on Almaden Road.

This alternative would require the purchase of six properties, two businesses, and portions of SJWC sites. It would impact approximately 3.4 acres of riparian and urban forest which would need to be mitigated at a 3:1 ratio. Off-site mitigation would be needed for 10.2 acres. The estimated cost of this alternative is $18.5 million.

Widened Cribwall Channel with Mitigation Bench

This alternative is similar to the widened gabion channel except cribwall bank with 1:6 side slopes would be constructed to create a wider bench to allow for revegetation. The bench elevations would vary from 5 to 10 feet above the natural channel bottom and 25 to 70 feet in width. Short bypass channels would be constructed to preserve existing vegetation at Guadalupe Avenue and Malone Road. The natural bank and vegetation between the channel bottom and the proposed bench excavation would be preserved where possible.

An 18-foot maintenance road would be constructed on the proposed bench. Maintenance access ramps from the proposed bench road to the channel bottom would be constructed at several locations throughout the reach.

A new bridge would be constructed at Willow Glen Way to span the widened cribwall channel.

The existing west bank and channel bottom would be preserved. Portions of the proposed bench would be revegetated. Active erosion existing on the west bank would be repaired with rock, gabions, or other suitable methods according to the maintenance program for erosion repair.

This alternative would require the purchase of six properties, two businesses, and portions of SJWC sites. It would impact approximately 3.4 acres of riparian and urban forest which would need to be mitigated at a 3:1 ratio. Off-site mitigation would be needed for 9.3 acres. The estimated cost of this alternative is $20.6 million.

West Bank Earth Bypass Channel

The earth bypass channel would be constructed to the west of the natural channel and the channel banks would have 2:1 side slopes.

Maintenance road would be located on the west top of bank of the natural channel. Ramps would be provided for access into the bypass channel.

Bridges would be constructed at Willow Glen Way and Malone Road to span the bypass channel.

The natural channel banks would not be disturbed except at erosion sites. Active erosion existing in the natural channel would be repaired with rock, gabions, or other suitable methods according to the maintenance program for erosion repair. Revegetation would be provided on both the east and west banks of the bypass channel. The bypass channel would be designed such that low flows would continue in the natural channel.

This alternative would require the purchase of 73 properties. There is no significant impact to the riparian vegetation with this alternative. The estimated cost of this alternative is $26 million.

Covered Bypass Channel

A double 13- by 20-foot RCB culvert would be constructed under Almaden Road adjacent to the existing river. The bypass channel would pass through the SJWC's well site upstream of Willow Glen Way. Two of the existing SJWC wells would be affected and piping would need to be relocated. The construction would be very costly due to constricted work space, traffic control, and relocation of existing utilities under Almaden Road which includes a 33-inch sewer line for the length of 4,700 feet.

A new bridge would be constructed at Willow Glen Way to span the bypass channel downstream.

The natural channel banks would not be disturbed except at erosion sites. Active erosion existing in the natural channel would be repaired with rock, gabions, or other suitable methods according to the maintenance program for erosion repair. The bypass channel would be designed to carry 5,000 cfs downstream through Reach 9. Low flows would continue in the natural channel.

This alternative would require the purchase of ten properties, two businesses, and portions of SJWC sites. It would impact approximately 0.7 acres of riparian and urban forest which would need to be mitigated at a 3:1 ratio. Off-site mitigation would be needed for 2.1 acres. The estimated cost of this alternative is $53.0 million.

Reach 10: Curtner Avenue to Capitol Expressway

The character of the Guadalupe River varies greatly in this reach. From Curtner Avenue to southbound Almaden Expressway (Reach 10A), the river runs adjacent to Almaden Road and is very similar to Reach 9. The channel is straight and deep with side slopes of 1:1 and steeper. This reach is mostly privately-owned except in areas where the District has flood control easements to repair bank erosion. The channel is below the 1 percent flow capacity. Narrow channel sections exist at several locations in this reach, creating hydraulic constrictions which will cause overbanking and high-flow velocities. Erosion has been, and will continue to be, a problem in this reach. During moderate flows, erosive velocities occur throughout the reach.. Existing erosion sites have been identified and may eventually require repair. Backwater effects from this reach would impact future 1 percent flow in Canoas Creek.

From southbound Almaden Expressway to Stream Flow Gage Station No. 23B (Reach 10B), the channel was improved in 1972 in conjunction with the Almaden Expressway widening project. The channel bottom is 60 feet wide and is lined with rock, and the channel banks have been lined with stepped gabions. The channel has the capacity to contain the 1 percent flow, but does not have adequate freeboard between southbound and northbound of Almaden Expressway.

From Stream Flow Gage Station 23B to Capitol Expressway (Reach 10C), the channel is not as wide as Reach 10B. The water surface rises rapidly through Reach 10C and induces flooding to the upstream areas.

The bridges that cross the river in Reach 10 are Curtner Avenue bridge, southbound and northbound of Almaden Expressway overpass, and Hillsdale Avenue bridge.

Reach 10A: (Curtner Avenue to Southbound Almaden Expressway) Alternatives Considered

The feasible alternatives considered in Reach 10A are channel widening, covered bypass channel, and earth bypass channel (see Figure 3.8 and Table 3.12).

Widened Gabion Channel with Bench

This alternative proposed widening of the east bank with a depressed bench. The bench would be constructed 5 to 10 feet above the natural channel bottom and would average 20 feet wide. The natural bank and vegetation between the channel bottom and the depressed bank would be preserved where possible.

An 18-foot maintenance road would be constructed on the proposed bench. No woody growth would be allowed to establish on the proposed bench. Maintenance access ramps from the proposed bench road to the channel bottom would also be constructed at several locations.

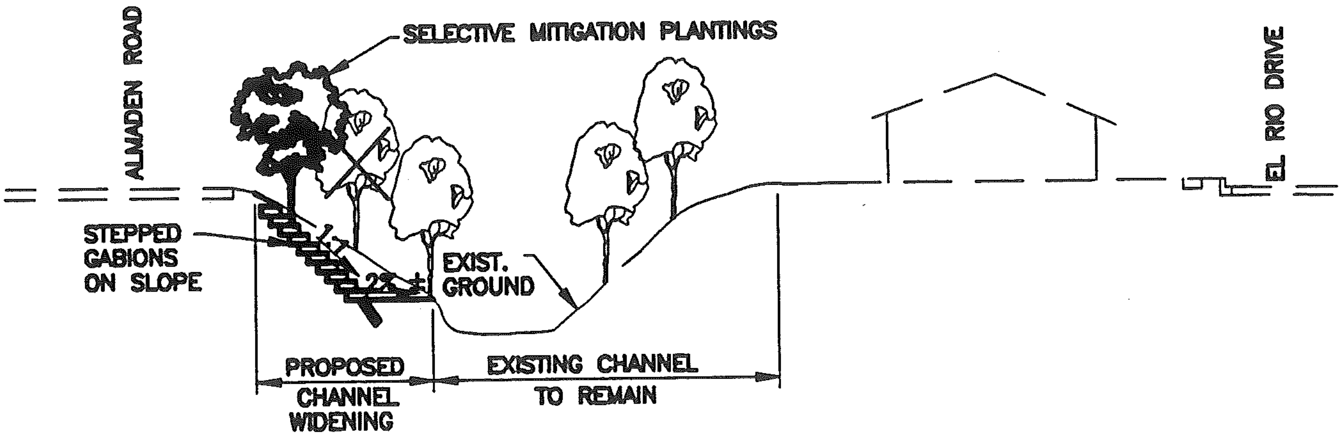
A new bridge would be constructed at Curtner Avenue to span the widened gabion channel.

The existing west bank and stream bottom would not be disturbed. Active erosion existing on the west bank would be repaired with rock, gabions, or other suitable methods according to the maintenance program for erosion repair.

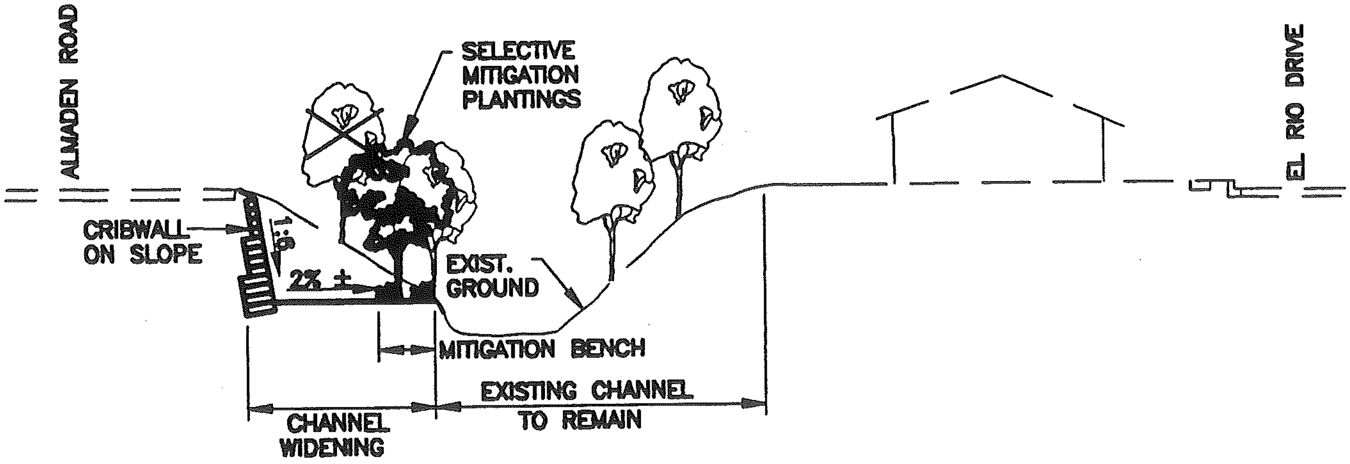
With this alternative, construction of 3.5-foot high floodwalls would be required in Canoas Creek from Almaden Expressway to the end of Nightingale Drive for future 1 percent flood protection in that reach of Canoas Creek. It would impact approximately 1.5 acres of riparian and urban forest which would need to be mitigated at 3:1 ratio. Off-site mitigation would be needed for 4.5 acres. The estimated cost of this alternative is $7.2 million.

Widened Cribwall Channel with Mitigation Bench

This alternative is similar to the widened gabion channel except a cribwall bank with 1:6 side slope would be constructed to create a wider bench to allow revegetation. The bench elevation would be 5 to 10 feet above the natural channel bottom, and the bench would be 40 feet wide. The natural bank and vegetation between the channel bottom and the proposed bench would be preserved where possible.


ALMADEN ROAD
SELECTIVE MITIGATION PLANTINGS
EL RIO DRIVE
STEPPED GABIONS ON SLOPE
1:1
2% ±
EXIST. GROUND
PROPOSED CHANNEL WIDENING
EXISTING CHANNEL TO REMAIN

WIDENED GABION CHANNEL WITH BENCH



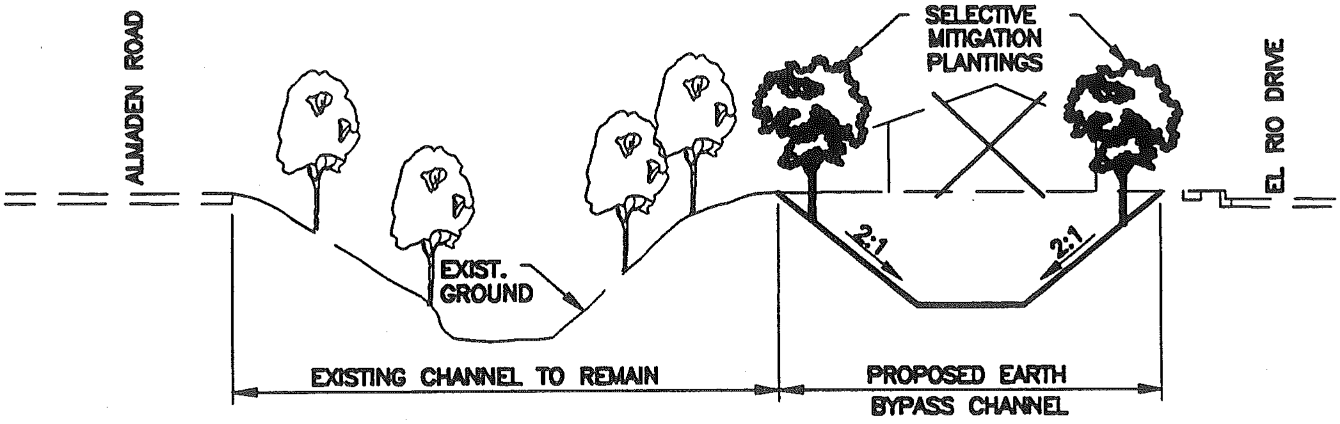
WIDENED CRIBWALL CHANNEL WITH MITIGATION BENCH

Figure 3.8

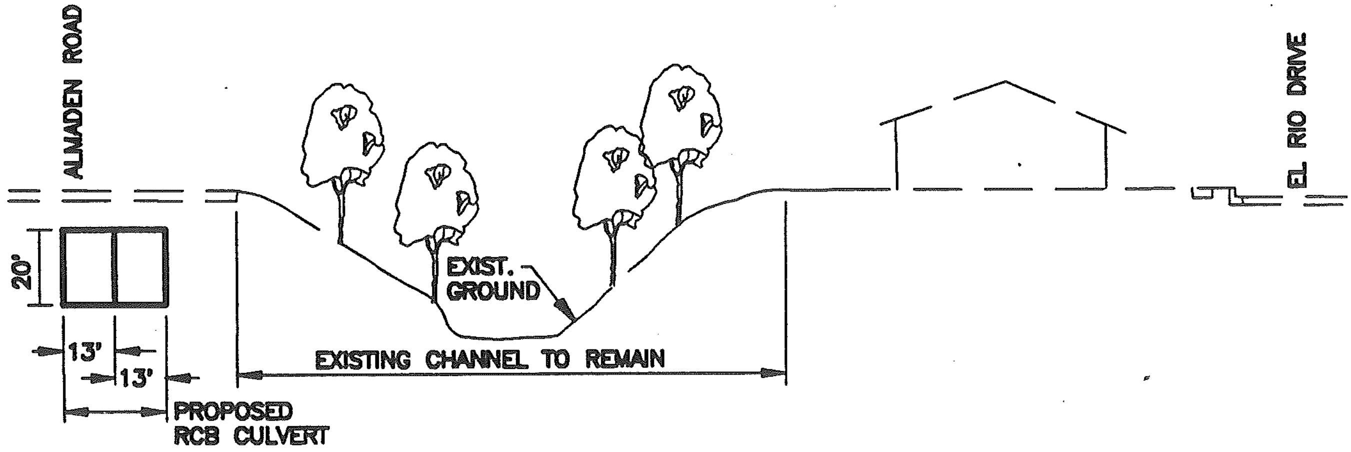
REACH 10A FEASIBLE ALTERNATIVES

TYPICAL SECTIONS

NTS


ALMADEN ROAD
SELECTIVE MITIGATION PLANTINGS
EL RIO DRIVE
2:1
2:1
EXIST. GROUND
EXISTING CHANNEL TO REMAIN
PROPOSED EARTH BYPASS CHANNEL

WEST BANK EARTH BYPASS CHANNEL



COVERED BYPASS CHANNEL

Figure 3.8 (cont'd)

REACH 10A FEASIBLE ALTERNATIVES

TYPICAL SECTIONS
NTS

TABLE 3.12
Comparative Summary of Feasible Alternatives, Reach 10A—Curtner Avenue to Almaden Expressway

Issues and Concerns	Widened Gabion Channel w/Bench	Widened Cribwall Channel with Mitigation Bench	West Bank Earth Bypass Channel	Covered Bypass Channel
1. Project Cost				
A. Right of Way	$ 0.0 million	$ 0.0 million	$ 5.1 million	$ 0.0 million
B. Construction	$ 2.2 million	$ 2.9 million	$ 1.3 million	$13.5 million
C. Mitigation on site	$ 0.0 million	$ 0.1 million	$ 0.1 million	$ 0.0 million
Mitigation off site	$ 3.2 million	$ 2.9 million	$ 0.2 million	$ 0.0 million
D. Construction cost on Canoas Creek	$ 1.8 million	$ 1.8 million	$ 1.7 million	$ 1.7 million
E. Total Cost	$ 7.2 million	$ 7.7 million	$ 8.4 million	$15.2 million
2. Physical Environment				
A. General Description	East bank of natural stream would be excavated 5 to 10 feet above the stream bottom and lined with gabions. Requires 3.5-foot high floodwalls on Canoas Creek.	East bank of natural stream would be excavated 5 to 10 feet above the stream bottom and lined with cribwall. Revegetation would be provided on bench. Requires 3.5-foot high floodwalls on Canoas Creek.	Natural stream would be undisturbed except at erosion sites. Earth bypass channel would be constructed to the west. Requires 1.5-foot high floodwalls on Canoas Creek.	A double 13- by 20-foot bypass box culvert to carry 5,000 cfs downstream, would be constructed to the east under Almaden Road. Natural stream to remain undisturbed except at erosion repair sites and at the confluence of the bypass and natural stream. Requires 1.5-foot high floodwalls on Canoas Creek.
B. Erosion	Ongoing erosion on the west bank to continue as it has in the past. Depressed bench area subject to possible erosion during high flows.	Ongoing erosion on the west bank to continue as it has in the past. Revegetated bench area subject to possible erosion during high flows.	Existing erosion sites repaired. Decrease erosion in natural stream due to diverted flows.	Existing erosion sites repaired. Decrease erosion in natural stream due to diverted flows.
C. Sedimentation	Slight decrease in sedimentation due to east bank gabion lining.	Slight decrease in sedimentation due to east bank cribwall lining.	Decrease in sedimentation due to decreased in erosion in natural stream.	Decrease in sedimentation due to decreased in erosion in natural stream.
D. Water Quality	Slight decrease in turbidity during high flows.	Slight decrease in turbidity during high flows.	Decrease in turbidity due to decreased erosion in natural stream.	Decrease in turbidity due to decreased erosion in natural stream.
E. Maintenance	Improved access from the maintenance road located on bench. Less intensive maintenance required in natural channel and revegetation areas. No woody growth would be allowed to establish on proposed bench.	Improved access from the maintenance road on bench. Less intensive maintenance required in natural channel. No maintenance required in mitigation area.	Less intensive maintenance in existing stream. Moderately intensive maintenance in bypass channel.	Access to natural channel would not improve but natural channel would have less intensive maintenance. Low level of maintenance required in bypass culvert but access would be difficult.

TABLE 3.12
Comparative Summary of Feasible Alternatives
Reach 10A—Curtner Avenue to Almaden Expressway (SB)
(continued)

Issues and Concerns	Widened Gabion Channel w/Bench	Widened Cribwall Channel with Mitigation Bench	West Bank Earth Bypass Channel	Covered Bypass Channel
3. Biological Environment				
A. Fish Habitat	Loss of upper bank habitat on east bank due to excavation.	Loss of upper bank habitat on east bank due to excavation. Dense revegetation on bench.	Habitat value of natural stream would increase due to decrease in maintenance activities.	Habitat value of natural stream would increase due to decrease in maintenance activities.
B. Wildlife Habitat	Loss of upper portion of east bank habitat except at bypass areas. Loss of vegetation at erosion sites. Revegetation on upper east bank. 1.5 acres impacted, 4.5 acres revegetated off site.	Loss of upper portion of east bank habitat except at bypass area. Loss of west bank vegetation at erosion sites. Dense revegetation on portion of bench. 1.5-acre impacted, 0.3 acres revegetated on site and 4.2 acres off site.	Habitat value in existing stream would increase over time due to less intensive maintenance and expanded riparian corridor. Revegetation on bypass channel banks. 0.3 acres impacted, 0.6 acre revegetated on site and 0.3 acre off site.	Habitat value of natural stream would increase over time due to less intensive maintenance. Loss of vegetation at erosion repair sites and at bypass junction. No significant habitat impact.
4. Socio-Cultural Environment				
A. Right of Way	No loss of homes. Acquisition of easements on west bank.	No loss of homes. Acquisition of easements on west bank.	Loss of 17 properties.	No loss of homes. Acquisition of easements on west bank.
B. Aesthetics	Would remove riparian vegetation from upper east bank.	Would remove riparian vegetation from upper east bank.	Would preserve the natural channel and create open space.	Would preserve the natural channel.
C. Recreation Potential	Possible linear path along bench.	Possible linear path along bench.	Possible linear pathway on top of banks of the natural channel.	No change. Poor access, path would be located on Almaden Road.

An 18-foot maintenance road would be constructed on the proposed bench. Maintenance access ramps from the proposed bench road to the channel bottom would be constructed at several locations throughout the reach.

A new bridge would be constructed at Curtner Avenue to span the widened cribwall channel.

The existing west bank and stream bottom would not be disturbed. Portions of the proposed bench would be revegetated. Active erosion existing on the west bank would be repaired with rock, gabions, or other suitable methods according to the maintenance program for erosion repair.

With this alternative, construction of 3.5-foot high of floodwalls would be required in Canoas Creek from Almaden Expressway to the end of Nightingale Drive for future 1 percent flood protection in that reach of Canoas Creek. It would impact approximately 1.5 acres of riparian and urban forest which would need to be mitigated at a 3:1 ratio. Off-site mitigation would be needed for 4.2 acres. The estimated cost of this alternative is $7.7 million.

West Bank Earth Bypass Channel

The earth bypass channel would be constructed to the west of the natural channel and the channel banks would have 2:1 side slopes.

Maintenance roads would be located on the top of the west bank of the natural channel. Ramps would be provided for access into the bypass channel.

A bridge would be constructed at Curtner Avenue to span the bypass channel.

The natural channel banks would not be disturbed except at erosion sites. Active erosion existing in the natural channel would be repaired with rock, gabions, or other suitable methods according to the maintenance program for erosion repair. Revegetation would be provided on both the east and west banks of the bypass channel. The bypass channels would be designed such that low flows would continue in the natural channel.

With this alternative, construction of 1.5-foot high floodwalls would be required in Canoas Creek from Almaden Expressway to the end of Nightingale Drive for future 1 percent flood protection in that reach of Canoas Creek. It would require the purchase of 17 properties and impact approximately 0.3 acres of riparian and urban forest which would need to be mitigated at a 3:1 ratio. The estimated cost of this alternative is $8.4 million.

Covered Bypass Channel

A double 13- by 20-foot RCB culvert would be constructed under Almaden Road adjacent to the existing river. The construction would be very costly due to constricted work space, traffic control, and relocation of utilities under Almaden Road which include a 28-inch sewer line for the length of 1,600 feet.

The natural channel banks would not be disturbed except at erosion sites. Active erosion existing in the natural channel would be repaired with rock, gabions, or other suitable methods according to the maintenance program for erosion repair. The bypass channel would be designed to carry 5,000 cfs downstream through Reach 9. Low flows would continue in the natural channel.

With this alternative, construction of 1.5-foot high floodwalls would be required in Canoas Creek from Almaden Expressway to the end of Nightingale Drive for future 1 percent flood protection in that reach of Canoas Creek.

The estimated cost of this alternative is $15.2 million. There is no significant impact to the riparian vegetation with this alternative.

Reach 10B: (Southbound Almaden Expressway to Stream Flow Gage Station No. 23B) Alternatives Considered

In the reach between southbound and northbound Almaden Expressway, the channel lacks adequate freeboard on the west bank. The feasible alternatives are either a levee or a floodwall.

From northbound Almaden Expressway to Stream Flow Gage Station No. 23B, the channel is adequate to contain the 1 percent flow. Revegetation plantings would be provided in this reach to mitigate riparian vegetation impacts in other reaches of the selected project.

Reach 10C: (Stream Flow Gage Station No. 23B to Capitol Expressway) Alternatives Considered

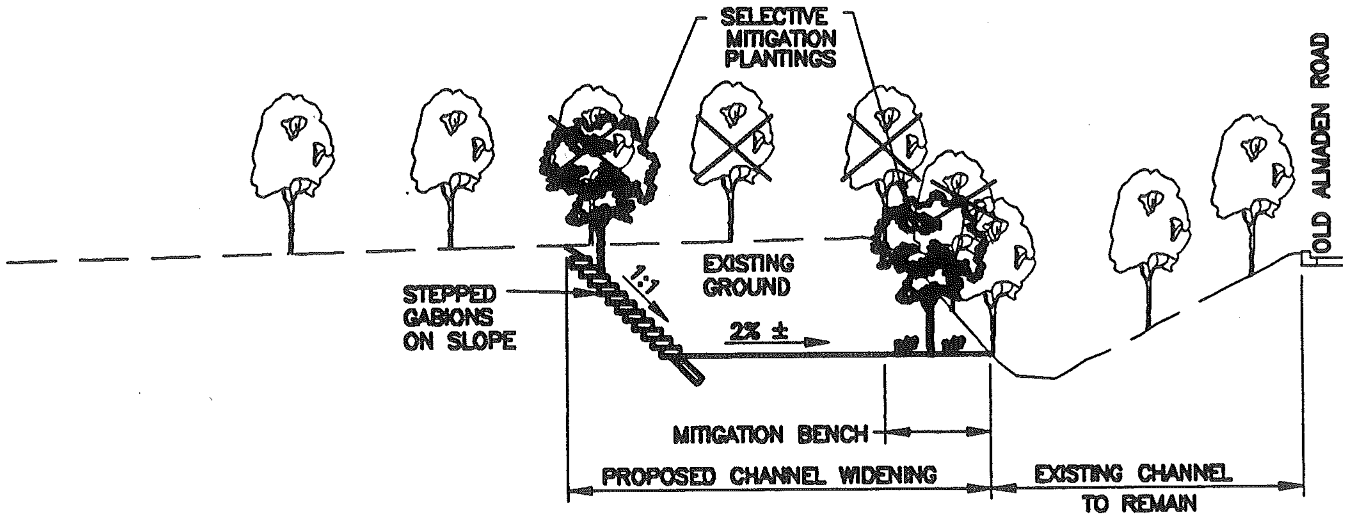
The feasible alternatives considered in this reach are bypass channel and channel widening (see Figure 3.9 and Table 3.13). Levees and floodwalls are not feasible because the water surface would remain high, causing pressure flow in Capitol Expressway and induce flooding to the upstream areas.

Widened Gabion Channel with Mitigation Bench

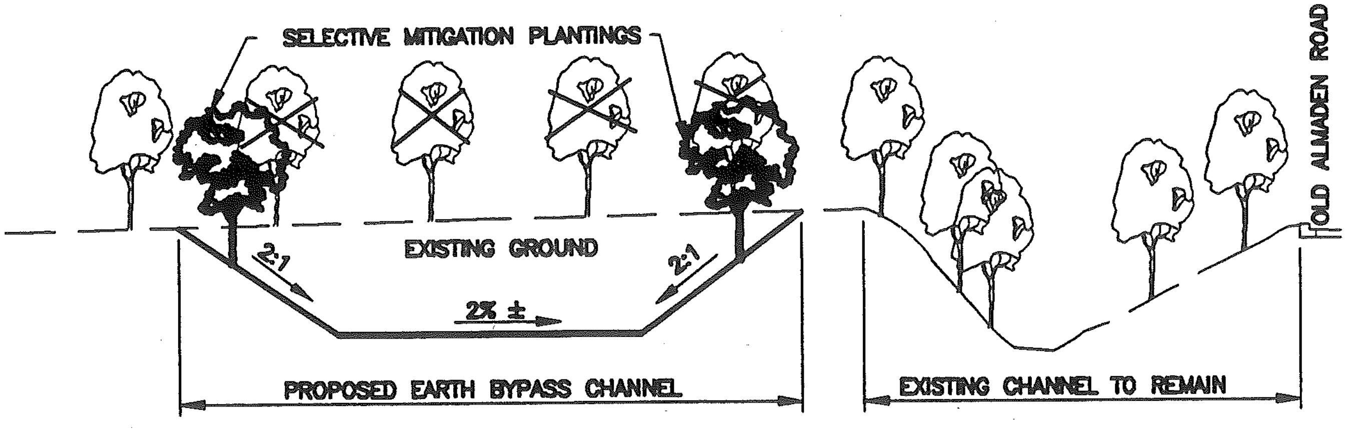
This alternative proposed widening of the east bank with a depressed bench. The bank would be lined with gabions at a 1:1 side slope. The bench would be constructed 5 to 10 feet above the natural stream bottom and would vary from 80 to 100 feet in width. The natural bank and vegetation between the channel bottom and the proposed bench elevation would be preserved where possible.

An 18-foot maintenance road would be constructed on the proposed bench. Maintenance access ramps from the proposed bench road to the channel bottom would be constructed at several locations.

A bridge would be constructed at the future Pearl Avenue alignment to span the widened gabion channel. Hillsdale Avenue bridge would be demolished only after the Pearl Avenue bridge is constructed.


SELECTIVE MITIGATION PLANTINGS
OLD ALMADEN ROAD
1:1
EXISTING GROUND
STEPPED GABIONS ON SLOPE
2% ±
MITIGATION BENCH
PROPOSED CHANNEL WIDENING
EXISTING CHANNEL TO REMAIN

WIDENED GABION CHANNEL WITH MITIGATION BENCH


SELECTIVE MITIGATION PLANTINGS
OLD ALMADEN ROAD
2:1
EXISTING GROUND
2:1
2% ±
PROPOSED EARTH BYPASS CHANNEL
EXISTING CHANNEL TO REMAIN

EARTH BYPASS CHANNEL

Figure 3.9

REACH 10C FEASIBLE ALTERNATIVES

TYPICAL SECTIONS

NTS

TABLE 3.13
Comparative Summary of Feasible Alternatives, Reach 10C—Stream Flow Gage Station No. 23B to Capitol Expressway

Issues and Concerns	Widened Gabion Channel with Mitigation Bench	Earth Bypass Channel
1. Project Cost		
A. Right of Way	$ 3.8 million	$ 8.0 million
B. Construction	$ 6.3 million	$ 6.7 million
C. Mitigation On Site	$ 0.5 million	$ 0.3 million
Mitigation Off Site	$ 4.2 million	$ 2.8 million
D. Total Cost	$14.8 million	$17.8 million
2. Physical Environment		
A. General Description	East bank would be excavated about 5 to 10 feet above the invert and lined with gabions. A portion of the earth bench would be revegetated. Hillsdale Avenue bridge would be demolished after Pearl Avenue bridge is constructed.	Earth bypass channel would be constructed to the east. Hillsdale Avenue after Pearl Avenue Bridge is constructed. Natural stream would be undisturbed except at erosion sites.
B. Erosion	Ongoing erosion on the west bank would continue as it has in the past. Revegetated bench area subject to possible erosion during high flows.	Existing erosion sites would be repaired. Decrease erosion in natural stream due to diverted flows.
C. Sedimentation	Slight decrease in sedimentation due to east bank gabion lining.	Decrease in sedimentation due to decreased erosion in natural stream.
D. Water Quality	Slight decrease in turbidity during high flows.	Decrease in turbidity due to decreased erosion in natural channel.
E. Maintenance	Improved access and less intensive maintenance required downstream of Hillsdale Avenue.	Less intensive maintenance in existing stream. Moderately intense maintenance in bypass channel.

TABLE 3.13
Comparative Summary of Feasible Alternatives, Reach 10C—Stream Flow Gage Station No. 23B to Capitol Expressway
(continued)

Issues and Concerns	Widened Gabion Channel with Mitigation Bench	Earth Bypass Channel
3. Biological Environment		
A. Fish Habitat	Loss of upper bank habitat on east bank due to excavation. Dense revegetation on bench.	Habitat value of natural stream would increase due to decreased in maintenance activities.
B. Wildlife Habitat	Impact to upper east bank and entire channel from Hillsdale Ave. to Capitol Expwy. Dense revegetation on a portion of the bench and on east bank. 2.75 acres impacted, 2.25 acres revegetated on site, and 6 acres off site.	Habitat value in existing stream would increase over time due to less intensive maintenance. 1.75 acres impacted. Revegetation on bypass channel banks. 1.3 acres of revegetation on site and 4 acres off site.
4. Socio-Cultural Environment		
A. Right of Way	No loss of homes but would require over 4 acres of land zoned for commercial and industrial development.	No loss of homes but would require over 9 acres of land zoned for commercial and industrial development.
B. Aesthetics	Would removes riparian vegetation from east bank but allow for dense revegetation on bench.	Would preserve and expand the natural channel and create open space.
C. Recreation Potential	Possible linear pathway along bench.	Possible linear pathway on bottom of bypass channel and top of existing east bank.

From Hillsdale Avenue to Capitol Expressway, the channel would be widened 20 feet to the east to provide a floodway bench. The east and west banks would be protected with gabions at a 1:1 side slope.

The existing west bank and stream bottom would not be disturbed. Portions of the proposed bench would be revegetated. Active erosion existing on the west bank would be repaired with rock, gabions, or other suitable methods according to the maintenance program for erosion repair.

This alternative would require the purchase of over 4 acres of land zoned for commercial and industrial development. It would impact approximately 2.75 acres of riparian and urban forest which would be mitigated at a 3:1 ratio. Off-site mitigation would be needed for 6 acres. The estimated cost of this alternative is $14.8 million.

Earth Bypass Channel

The earth bypass channel would be constructed to the east of the existing river. The bypass channel would have a 2:1 side slopes and have 60-foot bottom width.

Maintenance road would be located at the bypass channel bottom. Ramps would be provided for access into the bypass channel.

A bridge would be constructed at the future Pearl Avenue alignment to span the existing and bypass channel. Hillsdale Avenue bridge would be demolished only after the Pearl Avenue bridge is constructed.

From Hillsdale Avenue to Capitol Expressway, the channel would be widened 20 feet to the east to provide a floodway bench. The east and west banks would be protected with gabions at a 1:1 side slope.

Vegetation would be preserved in the existing channel. Active erosion existing in the natural channel would be repaired with rock, gabions, or other suitable methods according to the maintenance program for erosion repair. The bypass channel would be designed such that low flows would continue in the natural channel.

This alternative would require the purchase of over 9 acres of land zoned for commercial and industrial development. It would impact approximately 1.75 acres of riparian and urban forest which would be mitigated at a 3:1 ratio. Off-site mitigation would be needed for 4.0 acres. The estimated cost of this alternative is $17.8 million.

Reach 11: Capitol Expressway to Branham Lane

This reach has been modified as part of the Almaden Expressway widening and is nearly adequate to carry the 1 percent flow rate. The major issues in Reach 11 are high velocities, the backwater created on both Ross Creek and downstream of Branham Lane bridge, and inadequate freeboard.

This reach has poor maintenance access. Portions of the reach have a maintenance road along the east top of bank but there are no adequate maintenance ramps to the channel bottom. The improvements in this reach would eliminate flooding upstream of the Capitol

Expressway and Branham Lane bridges, improve the backwater effect on Ross Creek, and improve maintenance access.

Reach 11: Alternatives Considered

The feasible alternatives considered in this reach are gabion channel widening and bypass channel (see Figure 3.10 and Table 3.14). Levees/floodwalls were not evaluated in this reach because they would increase the water surface at Ross Creek and Branham Lane bridge and would adversely affect the local drainage systems.

Widened Gabion Channel with Bench

This alternative proposed widening on the east bank with an 18-foot wide depressed bench for floodway from Capitol Expressway to Bryan Avenue. The bench would be constructed 5 feet above the natural channel bottom. The bank below the bench would be sloped at 2:1 for revegetation, and the upper bank would be protected with stepped gabions at a 1:1 side slope. The distance from the top of east bank to the existing District right of way after channel widening would be 5 feet. The existing west bank would be undisturbed.

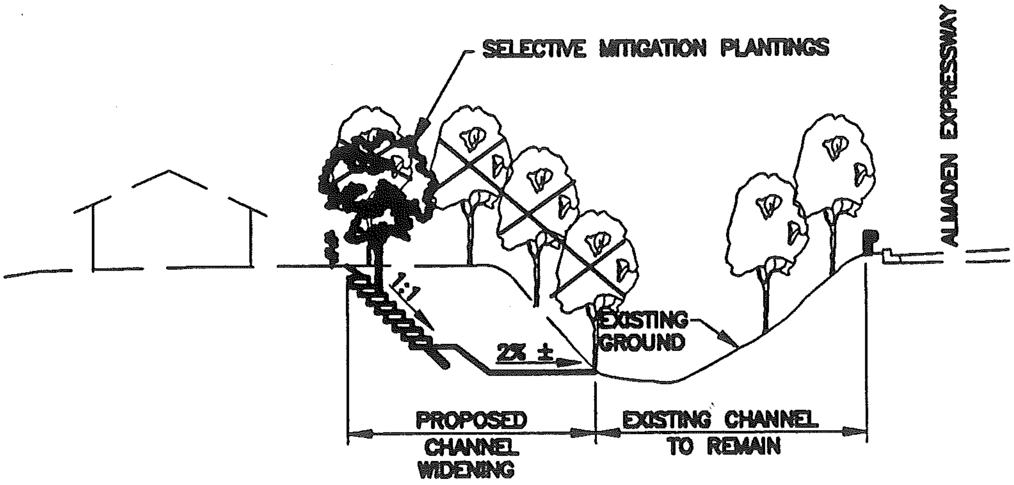
Maintenance road would be constructed on the proposed depressed bench. No woody growth would be allowed to establish on the proposed bench. Maintenance access ramps from the bench road to the channel bottom would be constructed at several locations.

From Bryan Avenue to Ross Creek confluence, the widening would be to the west creating a mitigation bench 3 feet above the river bottom. The bank would be lined with stepped gabion at a 1:1 side slope. The existing east bank would be undisturbed. The maintenance road from downstream of Bryan Avenue would continue on the east bank. A ramp would be provided on the west bank for access to the mitigation bench and the channel bottom.

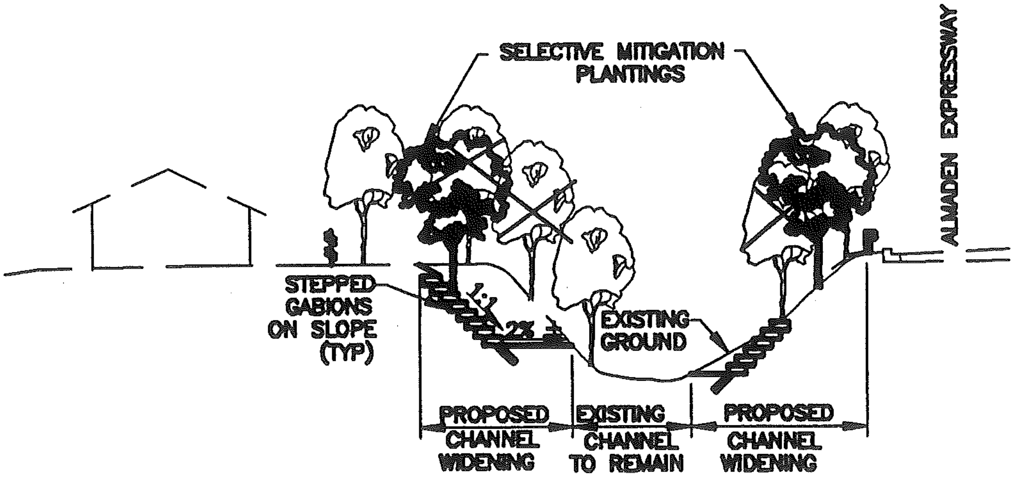
From Ross Creek confluence to Branham Lane, a widened gabion channel with floodway bench on the west bank 7 feet above the channel bottom would be constructed. The bank would be lined with stepped gabion at a 1:1 side slope. The existing east bank would be undisturbed. The existing maintenance road on the east bank would remain and connect to the proposed maintenance road from downstream.

Active erosion existing on the east and west banks would be repaired with rock, gabion, or other suitable methods according to the maintenance program for erosion repair.

This alternative would require relocation of one SJWC well, the purchase of three properties, and the removal of portions of a parking area for one commercial building. It would impact approximately 4.0 acres of riparian and urban forest which would need to be mitigated at a 3:1 ratio. Off-site mitigation would be needed for 10.7 acres. The estimated cost of this alternative is $14.1 million.

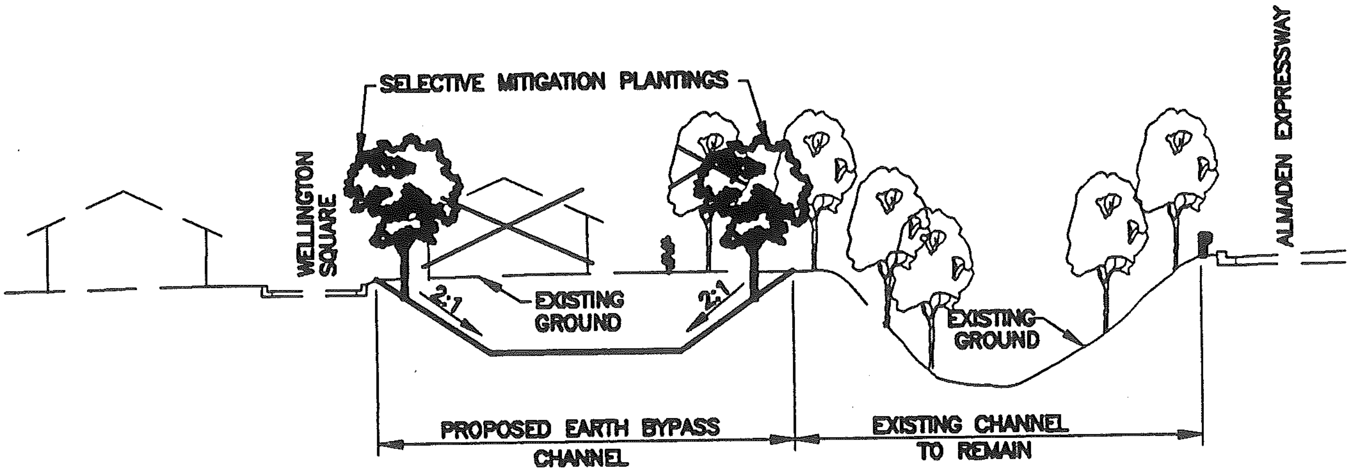

SELECTIVE MITIGATION PLANTINGS
ALMADEN EXPRESSWAY
1:1
2% ±
EXISTING GROUND
PROPOSED CHANNEL WIDENING
EXISTING CHANNEL TO REMAIN

WIDENED GABION CHANNEL WITH BENCH


SELECTIVE MITIGATION PLANTINGS
ALMADEN EXPRESSWAY
STEPPED GABIONS ON SLOPE (TYP)
1:1
2% ±
EXISTING GROUND
PROPOSED CHANNEL WIDENING
EXISTING CHANNEL TO REMAIN
PROPOSED CHANNEL WIDENING

WIDENED GABION CHANNEL

Figure 3.10
REACH 11 FEASIBLE ALTERNATIVES
TYPICAL SECTIONS
NTS


SELECTIVE MITIGATION PLANTINGS
WELLINGTON SQUARE
2:1
EXISTING GROUND
2:1
EXISTING GROUND
ALMADEN EXPRESSWAY
PROPOSED EARTH BYPASS CHANNEL
EXISTING CHANNEL TO REMAIN

EARTH BYPASS CHANNEL

Figure 3.10(cont'd)

REACH 11 FEASIBLE ALTERNATIVES

TYPICAL SECTIONS

NTS

TABLE 3.14
Comparative Summary of Feasible Alternatives
Reach 11—Capitol Expressway to Branham Lane

Issues and Concerns	Widened Gabion Channel with Bench	Widened Gabion Channel	Earth Bypass Channel
1. Project Cost			
A. Right of Way	$ 2.3 million	$ 2.3 million	$13.4 million
B. Construction	$ 4.0 million	$ 5.0 million	$ 4.9 million
C. Mitigation on site	$ 0.3 million	$ 0.3 million	$ 0.5 million
Mitigation off site	$ 7.5 million	$11.1 million	$ 2.8 million
D. Total Cost	$14.1 million	$18.7 million	$21.6 million
2. Physical Environment			
A. General Description	East bank would be excavated 5 feet above stream bottom and lined with gabions and a depressed bench for floodway would be created from Capitol Expressway to Bryan Avenue. The west bank would be excavated and lined with gabions and a bench would be created from Bryan Avenue to Branham Lane. The depressed bench from Bryan Avenue to Ross Creek confluence would be revegetated.	Both banks would be excavated and lined with gabions from Capitol Expressway to Bryan Avenue, creating a bench on the east bank. The west bank would be excavated and lined with gabions creating a bench from Bryan Avenue to Branham Lane. The bench from Bryan Avenue to Ross Creek confluence would be revegetated.	Earth bypass channel would be constructed to the east from Capitol Expressway to Bryan Avenue. The west bank would be excavated and lined with gabions creating a bench from Bryan Avenue to Branham Lane. The Bench from Bryan Avenue to Ross Creek confluence would be revegetated.
B. Erosion	Ongoing erosion on the west bank would continue as it has in the past. Depressed bench area subject to possible erosion during high flows.	Existing erosion sites repaired. Decrease erosion potential due to gabion lining on the banks.	Existing erosion sites would be repaired. Decrease erosion in natural channel due to diverted flows.
C. Sedimentation	Slight decrease in sedimentation due to east bank gabion lining.	Decrease in sedimentation due to both banks gabion lining.	Decrease in sedimentation due to decreased erosion in natural channel.
D. Water Quality	Slight decrease in turbidity during high flows.	Decrease in turbidity during high flows.	Decrease in turbidity due to decreased erosion in natural channel.
E. Maintenance	Improved maintenance access. Moderately intensive maintenance due to possible erosion of earth bank.	Improved maintenance access. Moderately intensive maintenance.	Less intensive maintenance in existing stream. Moderately intense maintenance in bypass channel.
3. Biological Environment			
A. Fish Habitat	Loss of upper bank habitat due to excavation.	Loss of upper bank habitat due to excavation.	Habitat value of natural stream would increase due to decreased in maintenance activities.

TABLE 3.14
Comparative Summary of Feasible Alternatives
Reach 11—Capitol Expressway to Branham Lane
(continued)

Issues and Concerns	Widened Gabion Channel with Bench	Widened Gabion Channel	Earth Bypass Channel
B. Wildlife Habitat	Loss of upper bank vegetation. Revegetation on earth bench. 4.0 acres impacted, 1.3 acres revegetated on site, and 10.7 acres off site.	Loss of upper bank vegetation. Revegetation on earth bench. 5.7 acres impacted, 1.3 acres revegetated on site, and 15.7 acres off site.	Habitat value in existing stream would increase over time due to less intensive maintenance. Revegetation on bypass channel banks. 2.2 acre impacted, 2.6 acres revegetated on site, and 4.0 acres off site.
4. Socio-Cultural Environment			
A. Right of Way	Loss of 3 properties, portions of a parking area of one business property, and relocation of one SJWC well.	Loss of 3 properties, portions of a parking area of one business property, and relocation of one SJWC well.	Loss of 36 properties, portions of a parking area of one business property, and relocation of one SJWC well.
B. Aesthetics	Would remove riparian habitat from upper east bank.	Would remove riparian habitat from west bank and upper east bank.	Would preserve the natural channel and create open space.
C. Recreation Potential	Possible linear pathway along bench.	Possible linear pathway along bench.	Possible linear pathway on bottom of bypass channel and top of existing east bank.

Widened Gabion Channel

This alternative proposed widening on both the east and west banks with an 18-foot wide depressed bench for floodway on the east bank from Capitol Expressway to Bryan Avenue. The distance from the top of east bank to the existing District right of way after channel widening would be 25 feet for revegetation. The proposed bench would be constructed 5 feet above the natural channel bottom. The natural bank and vegetation below the bench would be preserved where possible. The east and west banks would be lined with stepped gabions at a 1:1 side slope.

A maintenance road would be constructed on the proposed depressed bench. No woody growth would be allowed to establish on the proposed bench. Maintenance access ramps from the bench road to the channel bottom would be constructed at several locations.

From Bryan Avenue to Branham Lane, this alternative would be the same as the East Bank Widened Gabion Channel alternative.

Active erosion existing on the east and west banks would be repaired with rock, gabion, or other suitable methods according to the maintenance program for erosion repair.

This alternative would require relocation of one SJWC well, purchase of three properties, and the removal of portions of a parking area for one commercial building. It would impact approximately 5.7 acres of riparian and urban forest which would need to be mitigated at a 3:1 ratio. Off-site mitigation would be needed for 15.9 acres. The estimated cost of this alternative is $18.7 million.

Earth Bypass Channel

A bypass channel would be constructed to the east of the existing river from Capitol Expressway to Bryan Avenue. The bypass channel would have an 90-foot bottom width and a side slope of 2:1.

Maintenance access to the bypass channel would be provided by ramps from Wellington Square.

Vegetation in the existing channel would be undisturbed except at erosion sites. Active erosion existing in the natural channel would be repaired with rock, gabion, or other suitable methods according to the maintenance erosion guidelines. The bypass channel would be designed such that low flows would continue in the natural channel.

From Bryan Avenue to Branham Lane, this alternative would be the same as the East Bank Widened Gabion Channel Alternative.

Active erosion existing on the east and west banks would be repaired with rock, gabion, or other suitable methods according to the maintenance program for erosion repair.

This alternative would require the purchase of 36 properties, relocation of one SJWC well and the removal of portions of a parking area for one commercial building. It would impact approximately 2.2 acres of riparian and urban forest which would need to be mitigated at a 3:1 ratio. Off-site mitigation would be needed for 4.0 acres. The estimated cost of this alternative is $21.6 million.

Reach 12: Branham Lane to Blossom Hill Road

The river is straight and wide through this reach with side slopes varying from 1:1 to 2:1. The channel was excavated in the late 1960s as part of a private gravel quarry operation. Vegetation has been substantially altered by excavation and quarry operations. Most of the remaining vegetation is ruderal and riparian forest occurs only in scattered patches. Adjacent to the river, there are several offstream ponds owned by the District. The District has been utilizing these ponds and the river channel for groundwater percolation.

The Highway 85 overpass and future Chynoweth Avenue cross the river.

This reach has capacity to contain the 1 percent flow but does not have adequate freeboard from future Chynoweth Avenue to Blossom Hill Road.

Reach 12: Alternatives Considered

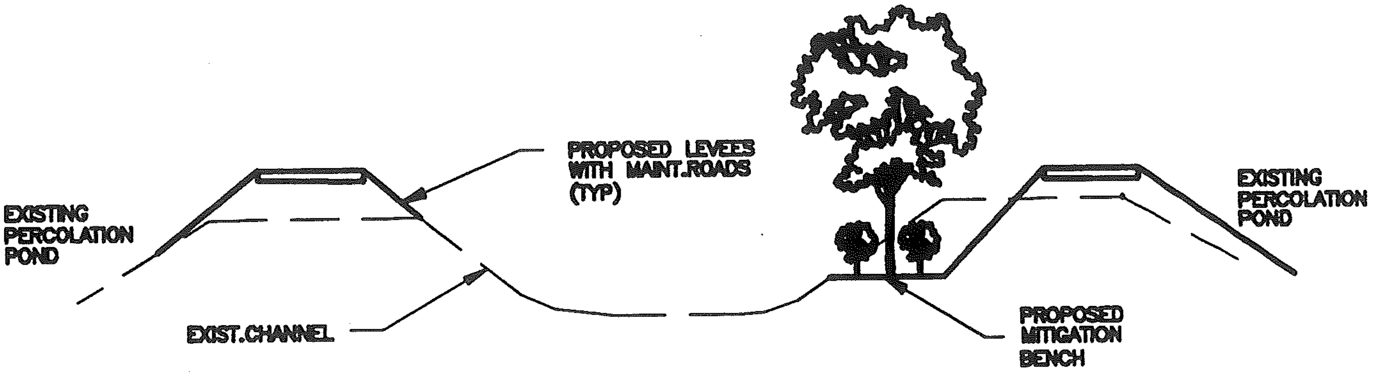
The feasible alternatives considered in this reach are levee raising and bypass channel (see Figure 3.11 and Table 3.15)

Levee Raising Only

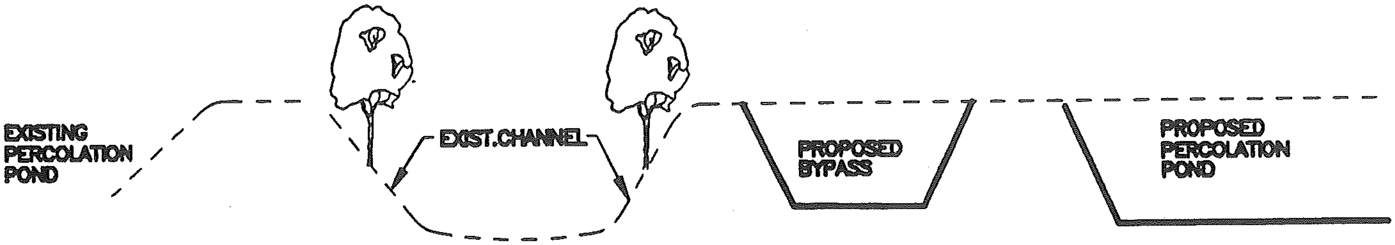
This alternative proposes to acquire adjacent land on the west bank, from Branham Lane to future Chynoweth Avenue, for mitigation to the impacts downstream. In order to create riparian, wetlands, and open water habitat, the adjacent land would be excavated 10 to 15 feet deep.

From future Chynoweth Avenue to Blossom Hill Road, the east and west bank levees would be reconstructed and raised up to 6 feet on both banks. The west bank levee would also be widened 25 feet to the west to create a revegetation bench. Maintainance roads would be located on top of the east and west banks. Maintainance access ramps to the channel bottom would be constructed at several locations.

There is no significant habitat impacts due to this alternative. It would impact approximately 3.0 acres of the existing off-stream percolation ponds which would have to be mitigated at a 1:1 ratio. Off-stream percolation ponds mitigation would be needed for 3.0 acres. The estimated cost of this alternative is $ 8.1 million.



LEVEE RAISING



EARTH BYPASS CHANNEL

Figure 3.11
REACH 12 FEASIBLE ALTERNATIVES
TYPICAL SECTIONS
NTS

TABLE 3.15
Comparative Summary of Feasible Alternatives, Reach 12—Branham Lane to Blossom Hill Road

Issues and Concerns	Levees Raising Only	Bypass Channel, Offstream Percolation Ponds, and Levee Raising
1. Project Cost		
A. Right of Way	$ 4.0 million	$22.2 million
B. Construction	$ 4.1 million	$ 9.5 million
C. Mitigation on site	$ 0.0 million	$ 0.0 million
Mitigation off site	$ 0.0 million	$ 0.0 million
D. Total Cost	$8.1 million	$31.7 million
2. Physical Environment		
A. General Description	Existing levees from future Chynoweth Avenue to Blossom Hill Road would be widened 25 feet to the west, reconstructed and raised.	A bypass channel would be constructed from Branham dam to future Chynoweth Avenue. The Branham and Blossom Hill dams operation would be discontinued. Existing levees from future Chynoweth Avenue to Blossom Hill Road would be widened 25 feet to the west, reconstructed and raised.
B. Erosion	Ongoing erosion would continue as it has in the past. Erosion repair on priority basis.	Existing erosion sites repaired. Widened earth bench area subject to possible erosion during high flows.
C. Sedimentation	No impact in sedimentation.	Decrease in sedimentation due to no seasonal dam operations
D. Water Quality	No impact in turbidity.	Decrease in turbidity during high flows.
E. Maintenance	Improved maintenance access. Intensity of maintenance would remain the same.	Improved maintenance access. Less intensive maintenance.
3. Biological Environment		
A. Fish Habitat	No loss of habitat.	Habitat value of natural channel would increase due to decrease in maintenance activities.
B. Wildlife Habitat	No significant impact to habitat. No significant impacts.	Habitat value of natural stream would increase due to less intensive maintenance. Revegetation on both banks of the channel.
4. Socio-Cultural Environment		
A. Right of Way	No loss of homes, but would require over 4 acres of land.	No loss of homes, but would require over 17 acres of land.
B. Aesthetics	No visual change except higher levee elevations.	Enhance the natural channel and higher levee elevations.
C. Recreation Potential	Possible linear pathway along maintenance roads.	Possible linear pathway along maintenance roads.

Bypass Channel and Off-Stream Percolation Ponds and Levee Raising

This alternative proposes constructing an earth bypass channel and mitigation ponds to the west of the natural channel from the Branham seasonal dam location to future Chynoweth Avenue Bridge. This will allow revegetation on both banks of the natural channel. The bypass channel would have a 40-foot bottom width and sideslope of 2:1. Maintainance road would be located on the top of bank between the natural and bypass channels.

Similar to the alternative above, from future Chynoweth Avenue to Blossom Hill Road, the east and west bank levees would be reconstructed and raised up to 6 feet on both banks of the channel. The west bank levee would also be widened 25 feet to the west to create a revegetation bench. Maintainance roads would be located on top of both the east and west banks.

This alternative also includes termination of the Branham and Blossom Hill seasonal dams operation and mitigate the impacts to the in-stream percolation ponds by constructing off-stream ponds. This will allow planting of shaded riverine aquatic habitat along both banks of the natural channel.

There is no significant habitat impact due to this alternative. It would impact approximately 3.0 acres of the existing off-stream percolation ponds and 14.0 acres of the in-stream ponds which would have to be mitigated at a 1:1 ratio. Off-stream percolation ponds mitigation would be needed for 17.0 acres. The estimated cost of this alternative is $ 31.6 million.

Canoas Creek: Guadalupe River to End of Nightingale Drive

Canoas Creek outfalls into Guadalupe River through a concrete box culvert under Almaden Expressway (northbound) upstream of Ironwood Drive. The existing District right of way is 90 feet wide and is bordered on each side by single family homes.

Upstream of Almaden Expressway to end of Nightingale Drive, the channel is a straight earth channel with a concrete channel bottom and a 1½:1 side slope.

The channel has the capacity to carry the 1 percent flow but the backwater effect from Guadalupe River would cause the channel to overtop. Culverts under Almaden Expressway and Nightingale Drive would be enlarged to provide 1 percent flow capacity.

The feasible alternative for this creek depends on the alternative selected in Reach 10A. If widened gabion channel or widened cribwall channel is selected, construction of 3.5-foot floodwalls would be required in Canoas Creek from Almaden Expressway to end of Nightingale Drive. If covered bypass channel or west bank earth bypass channel is selected, construction of 1.5-foot floodwalls would be required. Since there are levees existing on both the north and south banks, the floodwalls would not incur additional impacts to the local drainage. Figure 3.12 shows the typical section.

Levees were not evaluated due to right of way constraint and channel widening was not feasible because the primary problem is the backwater elevation in the Guadalupe River is controlling the water surface elevations.

An alternative to construct a bypass channel in the Valley View property, upstream of Gage Station 23B was also evaluated. From the aerial survey, it was found that the topography of the area slopes from Guadalupe River towards Canoas Creek and the channel slope of Guadalupe River is 13 times steeper than the Canoas Creek. Therefore, if the confluence of Canoas Creek is moved upstream from it's current location to Gage Station 23B, the water surface in the entire length of Canoas Creek will be raised by several feet. This alternative is considered not feasible because it would cause adverse impact and inundation to the upstream areas. The mitigation cost will be very costly. In addition, the construction cost for the open bypass is estimated to be $20 million, excluding mitigation costs.

Ross Creek: Guadalupe River to Jarvis Avenue

This creek consists of a straight trapezoidal earth channel with an 8-foot bottom width. The existing District right of way is 70 feet wide and is bordered on each side by single family homes.

This creek is inadequate to convey 1 percent design flow. Erosion has reshaped the channel so that the channel has a 1:1 side slope. In some places, the toe of the channel has been eroded to a point where the bank is nearly vertical and, in some cases, sloughing of the bank has occurred. Rock riprap and sacked concrete was installed on a maintenance basis to control erosion, especially from the outfalls daylighting into the creek. This reach is used for groundwater recharge. Instead of using seasonal gravel dams, water is released at a rate that it could naturally recharge through the creek bottom.

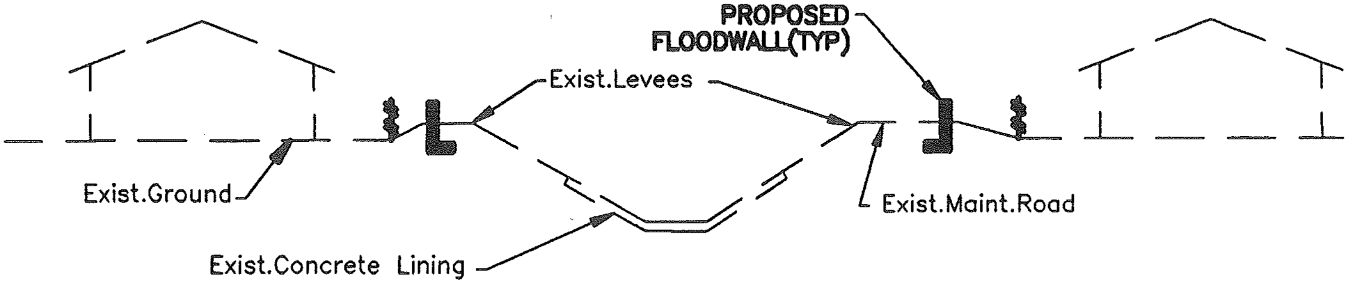
The box culverts under Almaden Expressway and Jarvis Avenue do not have capacity to convey 1 percent flow. The Cherry Avenue culvert was improved in 1982 by adding a second culvert.

Levees and floodwalls were investigated but found to be infeasible due to right of way constraints and adverse impact to local drainage. The only feasible alternative for this creek is channel widening.

The channel bottom would be widened from existing 10 feet to 30 feet with side slopes of 1:1. The creek bottom area used for groundwater recharge will increase by 2.0 acres. Both banks would be lined with articulated concrete mats (ACM). Figure 3.12 shows the typical section. An 18-foot wide maintenance road would be located at the top of south bank. To increase the capacity of culverts, a 20- by 10-foot box culvert, and a 13- by 9½-foot box culvert addition would be constructed under Almaden Expressway and Jarvis Avenue, respectively.

Summary of Alternatives

Table 3.16 summarizes and groups together the various alternatives for each of the reaches under broad plans having different objectives. The selected plan is the combination of alternatives that were selected through the evolutionary process with the public, city staff, District staff, regulatory agencies, and environmental consultants. The minimize vegetation impacts plan is the combination of alternatives which most avoids environmental impacts. The stream restoration plan is a combination of alternatives which would most reestablish the functions and values of the historic riparian corridor by preserving and enhancing the existing vegetation, minimizing the need for bank protection and using flatter slopes to allow for natural regeneration, expanding the riparian plantings and creating buffer areas. The intent was to define an environmentally enhancing plan that is comparable with other alternatives. It does not include complete reconstruction of a geomorphological "bankfull" channel in every reach of the natural channel. For comparison, a least cost plan is also included. Table 3.17 shows the comparison between the construction cost versus the impact acreage of each alternative.



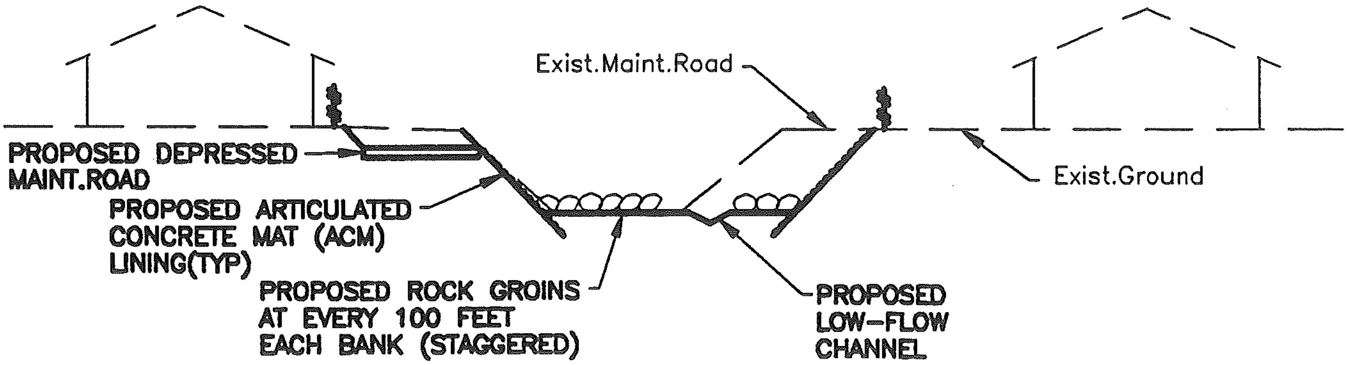
EXISTING CHANNEL WITH FLOODWALLS

Figure 3.12

CANOAS CREEK FEASIBLE ALTERNATIVE

TYPICAL SECTION

NTS


Exist.Maint.Road
PROPOSED DEPRESSED MAINT.ROAD
Exist.Ground
PROPOSED ARTICULATED CONCRETE MAT (ACM) LINING(TYP)
PROPOSED ROCK GROINS AT EVERY 100 FEET EACH BANK (STAGGERED)
PROPOSED LOW-FLOW CHANNEL

WIDENED CHANNEL WITH ARMORFLEX LINING

Figure 3.13

ROSS CREEK FEASIBLE ALTERNATIVE

TYPICAL SECTION

NTS

TABLE 3.16
Guadalupe River Planning Study
Summary of Alternative Plans
Reach A, Interstate 280 to Blossom Hill Road, Canoas Creek, and Ross Creek

Reach	Selected Project[1]	Minimize Vegetation Impacts Plan[2]	Stream Restoration Plan[2, 3]	Least Cost Plan
Reach A: Highway 101 to I-880	Levee/Floodwall	Levee/Floodwall	Levee/Floodwall	Levee/Floodwall
Right of Way Cost:	0	0	0	0
Construction Cost:	2.0	2.0	2.0	2.0
Mitigation:				
Right of Way Cost:	0	0	0	0
Revegetation Cost:	0	0	0	0
TOTAL COST:	2.0	2.0	2.0	2.0
Reach 6: I-280 to SPRR	Gabion Bypass Channel	Gabion Bypass Channel	Earth Bypass Channel	Gabion Bypass Channel
Right of Way Cost:	9.8	9.8	24.6	9.8
Construction Cost:	6.6	6.6	7.6	6.6
Mitigation:				
Right of Way Cost:	0.5	0.5	0.0	0.5
Revegetation Cost:	0.2	0.2	0.3	0.2
TOTAL COST:	17.1	17.1	32.5	17.1
Reach 7A: SPRR to Alma Avenue	Gabion Bypass Channel	Gabion Bypass Channel	Earth Bypass Channels (East and West Banks)	Gabion Bypass Channel
Right of Way Cost:	6.7	6.7	13.6	6.7
Construction Cost:	9.3	9.3	6.9	9.3
Mitigation:				
Right of Way Cost:	0	0	0	0
Revegetation Cost:	0	0	0.5	0
TOTAL COST:	16.0	16.0	21.0	16.0
Reach 7B: Alma Avenue to UPRR	Gabion Bypass Channel	Gabion Bypass Channel	Gabion Bypass Channel	Gabion Bypass Channel
Right of Way Cost:	1.3	1.3	1.3	1.3
Construction Cost:	2.8	2.8	2.8	2.8
Mitigation:				
Right of Way Cost:	0	0	0	0
Revegetation Cost:	0	0	0	0
TOTAL COST:	4.1	4.1	4.1	4.1

TABLE 3.16
Guadalupe River Planning Study
Summary of Alternative Plans
Reach A, Interstate 280 to Blossom Hill Road, Canoas Creek, and Ross Creek
(continued)

Reach	Selected Project[1]	Minimize Vegetation Impacts Plan[2]	Stream Restoration Plan[2, 3]	Least Cost Plan
Reach 8: U.P.R.R. to Willow Glen Way	Gabion Bypass Channel	Gabion Bypass Channel	Earth Bypass Channels (East and West Banks)	Gabion Bypass Channel
Right of Way Cost:	4.8	4.8	10.2	4.8
Construction Cost:	4.3	4.3	3.5	4.3
Mitigation:				
Right of Way Cost:	0.5	0.5	0	0.5
Revegetation Cost:	0.2	0.2	0.5	0.2
TOTAL COST:	9.8	9.8	14.2	9.8
Reach 9: Willow Glen Way to Curtner Avenue	Widened Cribwall Channel with Mitigation Bench	West Bank Earth Bypass Channel	West Bank Earth Bypass Channel	Widened Gabion Channel with Bench
Right of Way Cost:	3.9	21.9	21.9	3.9
Construction Cost:	10.0	4.1	4.1	7.5
Mitigation:				
Right of Way Cost:	4.7	0.0	0.0	5.1
Revegetation Cost:	2.0	0.0	0.0	2.0
TOTAL COST:	20.6	26.0	26.0	18.5
Reach 10A: Curtner Ave. to Almaden Expwy. (SB) & Canoas Creek	Widened Cribwall Channel with Mitigation Bench and 3.5′ Floodwalls in Canoas Creek	West Bank Earth Bypass Channel and 1.5′ Floodwalls in Canoas Creek	West Bank Earth Bypass Channel and 1.5′ Floodwalls in Canoas Creek	Widened Gabion Channel with Bench and 3.5′ Floodwalls in Canoas Creek
Reach 10A				
Right of Way Cost:	0.0	5.1	5.1	0.0
Construction Cost:	2.9	1.3	1.3	2.2
Mitigation:				
Right of Way Cost:	2.1	0.2	0.2	2.3
Revegetation Cost:	0.9	0.2	0.2	0.9
Canoas Creek:				
Construction Cost:	1.8	1.7	1.7	1.8
TOTAL COST:	7.7	8.5	8.5	7.2

TABLE 3.16
Guadalupe River Planning Study
Summary of Alternative Plans
Reach A, Interstate 280 to Blossom Hill Road, Canoas Creek, and Ross Creek
(continued)

Reach	Selected Project[1]	Minimize Vegetation Impacts Plan[2]	Stream Restoration Plan[2, 3]	Least Cost Plan
Reaches 10B & 10C: Almaden Expwy. (SB) to Capitol Expwy.	Levees and Widened Gabion Channel with Mitigation Bench U/S Gage Sta. 23B	Levees and Earth Bypass Channel U/S Gage Sta. 23B	Levees and Earth Bypass Channel U/S Gage Sta. 23B	Levees and Widened Gabion Channel with Bench U/S Gage Sta. 23B
Right of Way Cost:	3.8	8.0	8.0	3.8
Construction Cost:	6.4	6.8	6.8	6.4
Mitigation:				
Right of Way Cost:	3.0	2.0	2.0	2.3
Revegetation Cost:	1.7	1.1	1.1	1.0
TOTAL COST:	14.9	17.9	17.9	13.5
Reach 11: Capitol Expressway to Branham Lane	East Bank Widened Gabion Channel With Bench	Earth Bypass Channel	Earth Bypass Channel	East Bank Widened Gabion Channel with Bench
Right of Way Cost:	2.3	13.4	13.4	2.3
Construction Cost:	2.5	4.9	4.9	2.5
Mitigation:				
Right of Way Cost:	4.5	2.0	2.0	4.5
Revegetation Cost:	1.8	1.3	1.3	1.8
TOTAL COST:	11.8	21.6	21.6	11.8
Reach 12: Branham Lane to Blossom Hill Road	Levees Raising	Bypass Channel, Offstream Ponds, and Levee Raising	Bypass Channel, Offstream Ponds, and Levees Raising	Levee Raising
Right of Way Cost:	4.0	22.2	22.2	4.0
Construction Cost:	4.1	9.5	9.5	4.1
Mitigation:				
Right of Way Cost:	0.0	0.0	0.0	0.0
Revegetation Cost:	0.0	0.0	0.0	0.0
TOTAL COST:	8.1	31.7	31.7	8.1

TABLE 3.16
Guadalupe River Planning Study
Summary of Alternative Plans
Reach A, Interstate 280 to Blossom Hill Road, Canoas Creek, and Ross Creek
(continued)

Reach	Selected Project[1]	Minimize Vegetation Impacts Plan[2]	Stream Restoration Plan[2, 3]	Least Cost Plan
Ross Creek: Almaden Expressway to Jarvis Avenue	Widened Channel with ACM Lining	Widened Channel with ACM Lining	Widened Channel with ACM Lining	Widened Channel with ACM Lining
Right of Way Cost:	0.0	0.0	0.0	0.0
Construction Cost:	3.9	3.9	3.9	3.9
Mitigation:				
Right of Way Cost:	0.0	0.0	0.0	0.0
Revegetation Cost:	0.0	0.0	0.0	0.0
TOTAL COST:	3.9	3.9	3.9	3.9
Total Project Costs:				
Right of Way Cost:	36.6	93.2	120.3	36.6
Construction Cost:	56.6	57.2	55.0	53.4
Mitigation:				
Right of Way Cost:	15.3	5.2	4.2	15.2
Revegetation Cost:	6.8	3.0	3.9	6.1
TOTAL COST:	115.3	158.6	183.4	111.3

[1] Potential loss of revenue (property tax and benefit assessment) up to $30,000 per year.

[2] Potential loss of recharge water (up to $600,000 per year) due to accretion flows in Reach 12.

[3] Does not include complete reconstruction of a geomorphological "bankfull" channel in every reach of the natural channel.

TABLE 3.17
Summary Table for Guadalupe River Flood Control Construction Costs and Impact Acreage
Reaches A, 6-12, Canoas Creek, and Ross Creek

Reach	Selected Project	Minimize Vegetation Impacts Plan	Stream Restoration Plan
Reach A: Highway 101 to I-880	Levee/Floodwall	Levee/Floodwall	Levee/Floodwall
Construction Cost: Vegetation Impacted:	$2.0 million 0.0 acres	$2.0 million 0.0 acres	$2.0 million 0.0 acres
Reach 6: I-280 to SPRR	Gabion Bypass Channel	Gabion Bypass Channel	Earth Bypass Channel
Construction Cost: Vegetation Impacted:	$6.6 million 0.3 acres	$6.6 million 0.3 acres	$7.6 million 0.4 acres
Reach 7: SPRR to UPRR	Gabion Bypass Channel	Gabion Bypass Channel	Earth Bypass Channels
Construction Cost: Vegetation Impacted:	$12.1 million 0.0 acres	$12.1 million 0.0 acres	$15.2 million 0.8 acres
Reach 8: UPRR to Willow Glen Way	Gabion Bypass Channel	Gabion Bypass Channel	Earth Bypass Channels
Construction Cost: Vegetation Impacted:	$4.3 million 0.3 acres	$4.3 million 0.3 acres	$3.5 million 0.8 acres
Reach 9: Willow Glen Way to Curtner Avenue	Widened Cribwall with Mitigation Bench	West Bank Earth Bypass Channel	West Bank Earth Bypass Channel
Construction Cost: Vegetation Impacted:	$10.0 million 3.4 acres	$4.1 million 0.0 acres	$4.1 million 0.0 acres
Reach 10A: Curtner Avenue to Almaden Expwy (SB) and Canoas Creek	Widened Cribwall Channel with Mitigation Bench and 3.5 feet Floodwalls in Canoas Creek	West Bank Earth Bypass Channel and 1.5′ feet Floodwalls in Canoas Creek	West Bank Earth Bypass Channel and 1.5 feet Floodwalls in Canoas Creek
Reach 10A:			
Construction Cost: Vegetation Impacted:	$2.9 million 1.5 acres	$1.3 million 0.3 acres	$1.3 million 0.3 acres
Canoas Creek:			
Construction Cost: Vegetation Impacted:	$1.8 million 0.0 acres	$1.7 million 0.0 acres	$1.7 million 0.0 acres

TABLE 3.17
Summary Table for Guadalupe River Flood Control Construction Costs and Impact Acreage Reaches A, 6-12, Canoas Creek, and Ross Creek
(continued)

Reach	Selected Project	Minimize Vegetation Impacts Plan	Stream Restoration Plan
Reaches 10B & 10C: Almaden Expwy (SB) to Capitol Expwy	Levees and Widened Gabion Channel with Bench u/s of Gage Sta. 23B	Levee and Earth Bypass Channel u/s of Gage Sta. 23B	Levee and Earth Bypasss Channel u/s of Gage Sta. 23B
Construction Cost:	$6.4 million	$6.8 million	$6.8 million
Vegetation Impacted:	2.75 acres	1.75 acres	1.75 acres
Reach 11: Capitol Expwy to Branham Lane	East Bank Widened Gabion Channel With Bench	Earth Bypass Channel	Earth Bypass Channel
Construction Cost:	$2.5 million	$4.9 million	$4.9 million
Vegetation Impacted:	4.0 acres	2.2 acres	2.2 acres
Reach 12: Branham Lane to Blossom Hill Road	Levees Raising	Bypass Channel, Offstream Percolation Ponds,and Levee Raising	Bypass Channel, Offstream Percolation Ponds, and Levee Raising
Construction Cost:	$4.1 million	$9.5 million	$9.5 million
Vegetation Impacted:	0.0 acres	0.0 acres	0.0 acres
Ross Creek	Widened Channel with articulated concrete mat lining	Widened Channel with articulated concrete mat lining	Widened Channel with articulated concrete mat lining
Construction Cost:	$3.9 million	$3.9 million	$3.9 million
Vegetation Impacted:	0.0 acres	0.0 acres	0.0 acres
Total Project:			
Construction Cost:	**$56.6 million**	**$57.2 million**	**$60.5 million**
Vegetation Impacted:	**11.3 acres**	**4.9 acres**	**6.3 acres**

Note: Construction cost does not include mitigation cost

Project Selection

A selected project was selected based on a comparison of community acceptance, costs and impacts to environment, homes, and businesses. To ensure all concerns were addressed, the alternative was developed in close coordination with the City, SJWC, Caltrans, Santa Clara County Transportation Agency, and citizens residing in or owning property in the floodplain of the river.

Highway 101 to I-880 (Reach A)

The selected alternative is compatible with the improvements proposed by Caltrans for Highway 87.

I-280 to SPRR (Reach 6)

The selected alternative is the gabion bypass channel and is the same as the minimize vegetation impacts alternative. This alternative would avoid impacts to the natural stream channel and would restore and maintain the existing aquatic ecosystem by providing a buffer between the natural channel and adjacent development. Habitat value of the natural channel would increase over time due to less intensive maintenance.

The widened gabion channel alternative was not selected because it had greater impacts to the aquatic ecosystem. All east bank vegetation above the depressed bench would be lost. Revegetation would be provided on portions of the bench and top of bank.

The earth bypass channel on the east bank alternative is most suitable as the stream restoration alternative because revegetation could be provided on both banks of the channel. It would preserve and expand the functions and values of the historic natural riparian corridor. It would also provide a buffer between the natural channel and adjacent development. Habitat values of the natural channel would increase over time due to less intensive maintenance. With this alternative, many of the policies of the City's Riparian Corridor Policy would be implemented. However, it was not selected because it has major socio-economic impacts and a high cost of purchasing 100 properties. This alternative is considered impracticable.

SPRR to Alma Avenue (Reach 7A)

The selected alternative is the gabion bypass channel and is the same as the minimized vegetation impacts alternative. This alternative would avoid impacts to the natural stream channel and would restore and maintain the existing aquatic ecosystem by providing a buffer between the natural channel and adjacent development. Habitat value of the natural channel would increase over time due to less intensive maintenance.

The widened gabion channel alternative was not selected because it had greater impacts to the aquatic ecosystem. All east bank vegetation above the depressed bench would be lost.

The earth bypass channels on the east and west banks alternative is the most suitable as the stream restoration alternative because revegetation could be provided on both banks of the channels. It would preserve and expand the functions and values of the historic natural riparian corridor. It would also provide a buffer between the natural channel and adjacent development. Habitat values of the natural channel would increase over time due to less intensive maintenance. With this alternative, many of the policies of the City's Riparian Corridor Policy would be implemented. However, it was not selected because it has major socio-economic impacts and a high cost of purchasing 23 properties. This alternative is considered impracticable.

Alma Avenue to UPRR (Reach 7B)

The selected alternative is the gabion bypass channel and is the same as the minimized vegetation impacts alternative as well as the stream restoration alternative. This alternative would avoid impacts to the natural stream channel and would restore and maintain the existing aquatic ecosystem by providing a buffer between the natural channel and adjacent development. Habitat value of the natural channel would increase over time due to less intensive maintenance.

The widened gabion channel alternative was not selected because it had greater impacts to the aquatic ecosystem. All east bank vegetation above the depressed bench would be lost.

The covered bypass channel is also most suitable as the minimized vegetation impacts alternative. However it was not selected because it has a high cost of $9.0 million.

UPRR to Willow Glen Way (Reach 8)

The selected alternative is the gabion bypass channel and is the same as the minimize vegetation impacts alternative. This alternative would avoid impacts to the natural stream channel and would restore and maintain existing aquatic ecosystems by providing a buffer between the natural channel and adjacent development. Habitat value of the natural channel would increase over time due to less intensive maintenance.

The widened gabion channel alternative was not selected because it has greater impacts to the aquatic ecosystem. All east bank vegetation above the depressed bench would be lost. However, revegetation would be provided on portions of the bench and top of bank.

The earth bypass channels on the east and west banks alternative is most suitable as the stream restoration alternative because revegetation could be provided on both banks of the channel. It would preserve and expand the functions and values of the historic natural riparian corridor. It would also provide a buffer between the natural channel and adjacent development. Habitat values of the natural channel would increase over time due to less intensive maintenance requirements. With this alternative, many of the policies of the City's Riparian Corridor Policy would be implemented. However, it was not selected because it has major socio-economic impacts and a high cost of purchasing 41 properties. This alternative is considered impracticable.

Willow Glen Way to Curtner Avenue (Reach 9)

The selected alternative is the widened cribwall channel with mitigation bench. This alternative would avoid impact to the riparian habitat on the west bank and on the lower portion of the east bank. Two short bypass channels would be created to minimize impacts to the existing natural stream channel. To reduce impacts over time, revegetation would be provided on the depressed bench and top of bank and less intensive maintenance would need to be performed in the channel.

The widened gabion channel alternative is similar in cost and impacts to the selected alternative; but it was not selected because it did not allow for revegetation on the depressed bench.

The covered bypass channel alternative was not selected because of the socio-economic impacts and high construction cost. Construction of a box culvert along Almaden Road would create major traffic disruptions. Several SJWC wells and facilities, and a major sewer line under Almaden Road would be relocated. The construction of the culvert would require at least 3 years to complete. This alternative is considered infeasible and impracticable.

The earth bypass channel on the west bank alternative is most suitable as the minimize vegetation impacts and the stream restoration alternatives because it would preserve and expand the functions and values of the historic natural riparian corridor. It would also provide a buffer between the natural channel and adjacent development. Habitat values of the natural channel would increase over time due to less intensive maintenance. With this alternative, many of the policies of the City's Riparian Corridor Policy would be implemented. However, it was not selected because it has major socio-economic impacts and a high cost of purchasing 73 properties. This alternative is considered impracticable.

Curtner Avenue to Southbound Almaden Expressway (Reach 10A)

The selected alternative is the widened cribwall channel with mitigation bench. This alternative would avoid impacts to the riparian habitat on the west bank and on the lower portion of the east bank. To reduce impacts over time revegetation would be provided on the depressed bench and top of bank and less intensive maintenance would be performed in the channel. This alternative would also require construction of 3.5-foot high floodwalls on Canoas Creek from Almaden Expressway to end of Nightingale Drive for future 1 percent flood protection in Canoas Creek.

The widened gabion channel alternative is similar in cost and impacts to the selected alternative, but it was not selected because it did not allow for revegetation on the depressed bench. Construction of 3.5-foot high floodwalls would also be required on Canoas Creek.

The covered bypass channel alternative was not selected because it has socio-economic impacts and a high construction cost. Construction of a box culvert along Almaden Road would cause major traffic disruptions. A major sewer line under Almaden Road would need to be relocated. Construction of 1.5-foot high floodwalls would also be required on Canoas Creek. This alternative is considered impracticable.

The earth bypass channel on the west bank alternative is most suitable as the minimize vegetation impacts alternative and the stream restoration alternatives because it would preserve and expand the functions and values of the historic natural riparian corridor. It would also create a buffer between the natural channel and adjacent development. Habitat values of the natural channel would increase over time due to less intensive maintenance. With this alternative, many of the policies of the City's Riparian Corridor Policy would be implemented. However, it was not selected because it requires purchasing 17 properties. Construction of 1.5-foot high floodwalls would also be required on Canoas Creek. This alternative is considered impracticable.

Southbound Almaden Expressway to Capitol Expressway (Reach 10B-10C)

The selected alternative is the widened gabion channel with mitigation bench. This alternative would avoid impacts to the riparian habitat on the west bank and on the lower portion of the east bank. To reduce impacts over time revegetation would be provided on the depressed bench and top of bank and less intensive maintenance would be performed in the channel.

The earth bypass channel on the east bank alternative is most suitable as the minimize vegetation impacts and the stream restoration alternative because it would preserve and expand the functions and values of the historic natural riparian corridor. It would also provide a buffer between the natural channel and adjacent development. Habitat values of the natural channel would increase over time due to less intensive maintenance. With this alternative, many of the policies of the City's Riparian Corridor Policy would be implemented. However, it was not selected because the impacts were not much less than the selected alternative and the estimated land cost is very expensive. This alternative is considered impracticable.

Capitol Expressway to Branham Lane (Reach 11)

The selected alternative is the east bank widened gabion channel with bench. This alternative would avoid impacts to the riparian habitat on the west bank. From Bryan Avenue to Branham Lane, only the west bank would be widened, creating a depressed bench for floodway. To reduce impacts over time, revegetation would be provided on the depressed bench and top of bank from Bryan Avenue to Ross Creek confluence; and less intensive maintenance would be performed in the channel.

The widened gabion channel with bench alternative was not selected because it has greater impacts to the aquatic ecosystem. Vegetation on both east and west banks from Capitol Expressway to Bryan Avenue would be impacted. From Bryan Avenue to Branham Lane, this alternative is the same as the selected alternative.

The earth bypass channel on the east bank alternative is most suitable as the minimize vegetation impacts and the stream restoration alternatives because it would preserve and expand the functions and values of the historic natural riparian corridor. It would also provide a buffer between the natural channel and adjacent development. Habitat values of the natural channel would increase over time due to less intensive maintenance. With this alternative, many of the policies of the City's Riparian Corridor Policy would be implemented. However, it was not selected because it has major socio-economic impacts and a high cost of purchasing 36 properties. This alternative is considered impracticable.

Branham Lane to Blossom Hill Road (Reach 12)

The selected alternative is levee raising. This alternative would avoid impact to the riparian habitat in the natural channel between Branham Lane and future Chynoweth Avenue. To create revegetation bench from future Chynoweth Avenue to Blossom Hill Road, the west bank levee would be widened to the west. The levee would be reconstructed and raised.

The bypass channel, off-stream ponds, and levee raising alternative is most suitable as the minimize vegetation impacts alternative because it would preserved and expand the functions and values of the historic natural riparian corridor. It would also provide a buffer between the natural channel and adjacent development. Habitat values of the natural channel would increase over time due to less intensive maintenance. With this alternative, many of the policies of the City's Riparian Corridor Policy would be implemented. However, it was not selected because it has major water supply recharge program impacts and a high cost of purchasing land for mitigation. This alternative is considered impracticable.

Canoas Creek (Almaden Expressway to End of Nightingale Drive)

The selected alternative depends on the alternative selected in Reach 10A. Therefore, since the alternative selected in Reach 10A is widened cribwall with mitigation bench, construction of 3.5-foot high floodwalls would be required on Canoas Creek.

Ross Creek (Almaden Expressway to 700 Feet Upstream of Jarvis Avenue)

The selected alternative is channel widening and box culvert additions. Both banks would be widened and lined with ACM.

Levees and floodwalls were not selected because of right of way constraints and adverse impacts to local drainage.

Fluvial Geomorphological Approach

A fluvial geomorphological approach to stream restoration was considered for all the reaches. This approach proposed to construct a meandering multi-stage channel consisting of: a thalweg or low-flow channel; a bankfull channel, which contains the sediment carrying or channel-forming flow that has a 1.5-year rainfall return period; and a terraced floodplain that carries the high flows. The multi-stage channel design would accommodate future changes in the river system as well as allowing the river channel to achieve a dynamic equilibrium.

Erosion and sedimentation problems would be minimized and maintenance cost reduced. An opportunity would be provided for significant new riparian vegetation to re-establish and for a functional physical and biological river system that allows natural processes to occur while restoring and maintaining habitat values for fish and wildlife. This approach would necessitate widening the floodplain of the stream by as much as a few hundred feet and complete reconstruction of a meandering geomorphological bankfull channel, ensuring major impacts to the existing native riparian vegetation SRA habitat, fisheries, and adjacent homes if present. It does not meet the Clean Water Act section 404(b)(1) guideline requirements for consideration of alternatives. The Clean Water Act states a permit cannot be issued in circumstances where a less environmentally damaging practicable alternative for the proposed project exists.

The fluvial geomorphological approach has been incorporated in Reach 10B where impacts would not be significant. This approach could not be incorported in Reach 12 due to the existing in-stream percolation pond operations in this reach. At all other reaches, it would cause major impact to wetland, riparian vegetation, and SRA habitats. At Reach A, the channel could only accomodate a non-vegetated "bankfull" channel with very marginal environmental habitat but would have significant impact to wetlands.

The design of the bypass channel alternative has incorporated some of the fluvial geomorphological concepts. In the bypass channel alternative, the design includes diverting flows above "bankfull" flow into the bypass channel, keeping the "bankfull" flow in the natural channel. This bypass channel functions as the floodplain in the geomorphological multi-staged channel but avoids the impacts to the riparian habitat which would occur when trying to excavate a floodplain bench.

FEASIBILITY OF INSTALLING INFLATABLE DAMS IN REACH 12

Existing Temporary Gravel Dams Operation

The Districtoperates eleven seasonal gravel dams in the Guadalupe River watershed for in-stream percolation. These dams are located as shown in Figure 3.14. The District is pursuing permits to maintain and to expand the recharge program beyond the eleven dams. Historically, 14 seasonal gravel dams were operated in the watershed.

Of the eleven dams, two are located on Guadalupe River between Branham Lane and Blossom Hill Road: 1,000 feet upstream of Branham Lane and 1,800 feet downstream of Blossom Hill Road. They are referred to as the Branham Dam and the Blossom Hill Dam, respectively. These dams, along with the three adjacent off-stream ponds, make up the Blossom Hill percolation system. These dams are installed seasonally for in-stream percolation. The Blossom Hill Dam also creates a tailwater conditions that would provide enough head for water to fill the three adjacent ponds. A pipeline was constructed recently to provide an option to take water from the Alamitos Pond to the three ponds.

The dams are routinely constructed in the spring (after April 15) and are generally removed by October 15. The District attempts to retain the dams in the channel as long as possible to maximize percolation time. The District can notify the California Department of Fish and Game warden if the District intends to leave the dam in place after October 1 with the understanding that at the onset of significant rains, the dams will be breached.

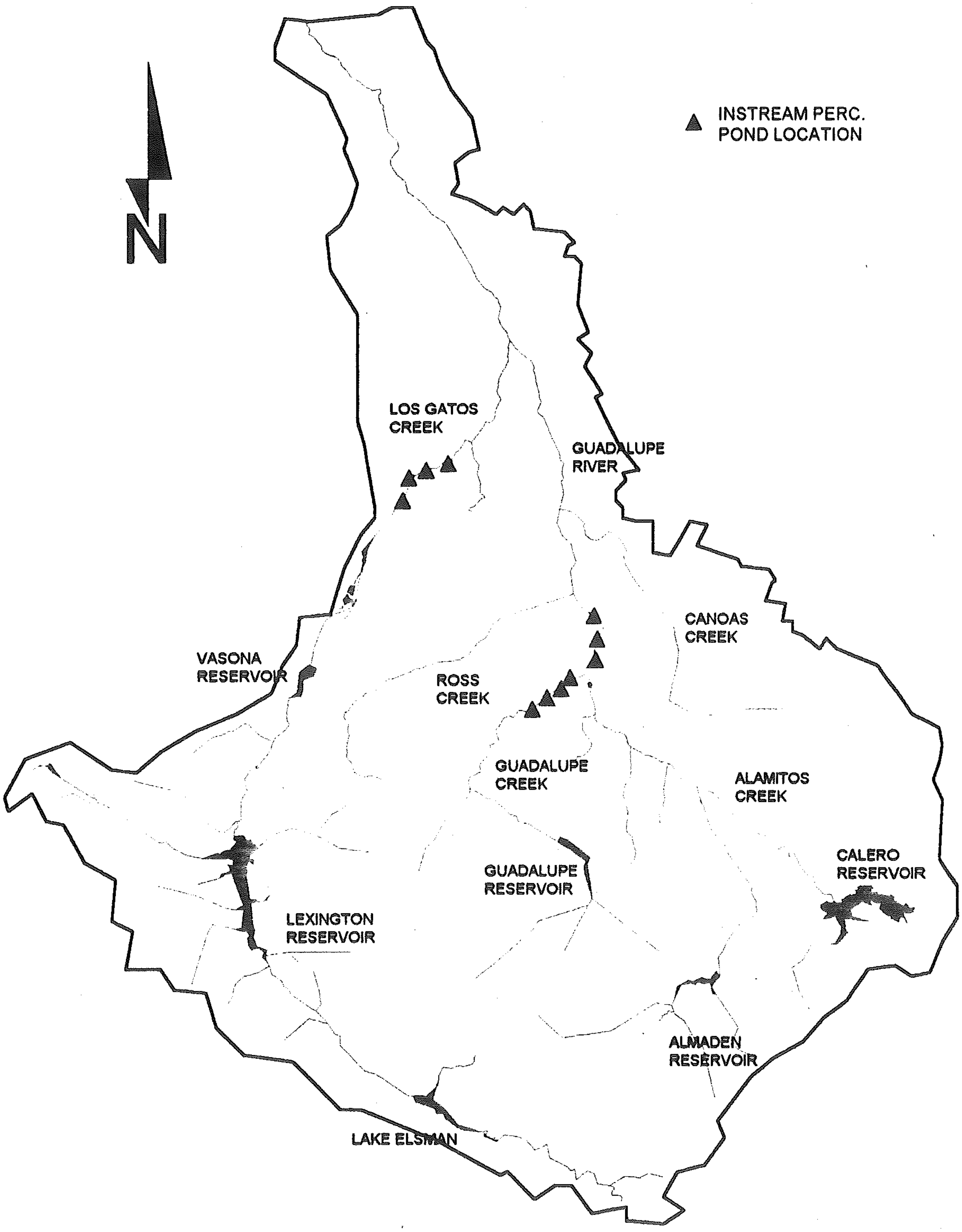


FIGURE 3.14 - INSTREAM PERCOLATION POND SITES WITHIN THE GUADALUPE RIVER WATERSHED

The dams are usually constructed at an elevation approximately 2 feet above the overflow devices installed on the bank. The overflow devices control the water surfaces in the channel at elevation 164.4 for the Branham Dam and at elevation 171.3 for the Blossom Hill Dam. The in-stream ponds have approximately 11 feet in depth behind the dams and tapering upstream. The District attempts to control the amount of overflow at the Branham Dam such that most flows will be percolated before reaching Stream Flow Gage Station No. 23B.

Inflatable Dams Alternative

The alternative evaluated was to relocate the Branham Dam 700 feet downstream, creating an additional 2.7-acre of in-stream pond. The Blossom Hill Dam would remain at the same location. The inflatable dam will opearate year-round to "capture" additional storm water in winter months which could be used for recharge. The benefit is not just additional recharge generation, but the ability to create a "new source of supply." The operations between April and October would be the same as with the present gravel dam.

The dams would generally remain inflated year-round except when flows exceed 100 cfs, they would automatically be deflated. A control system would be installed allow the dams to be inflated and deflated manually or controlled from a remote site. There would also be a redundant control system in place to insure reliability. Whenever flows exceed 100 cfs, the Branham Dam would first deflate at a controlled rate to prevent any impact to downstream by a large surge of water. The dam would reinflate when flows measured at Stream Flow Gage Station No. 20 dropped to 10 cfs.

Fish bypass structures would be constructed at the dams so that the dam operations would not affect fish migration. The concrete foundation would be designed such that there will be a low flow channel with adequate depth for fish passage. The detailed design of the fish bypass structure might need to involve construction of a physical model. It will require a multi-disciplinary design team including engineers, fish biologist, and artist for aesthetic design. Predation and poaching will also be the design considerations.

The dams would be operated such that flows in the creek below 100 cfs would continue through the fish bypass structures. Flows exceeding 100 cfs would raise the water level and cause the floating control device to trigger the dam to deflate. Gates would be installed to allow continuous flows up to 5 cfs in the fish bypass structure at different water levels as the dam reinflates and the pond area fills. Therefore, only those flows in excess of 5 cfs would begin to fill a pond behind the dam.

To evaluate the potential impacts due to flow augmentation from the inflatable dam operations and their associated percolation ponds on fisheries, a hydrologic analysis was performed. The analysis includes estimating the short-term and long-term changes to the flows in the Guadalupe River and calculating the groundwater recharge benefits for the months of October to April when gravel dams are not permitted to be installed. A detailed discussion of the analysis is contained in Appendix N.

Based on the results of the analysis, the amount of time that 5 cfs or more flows in the Guadalupe River was increased on average 17 additional days (13 percent increase) per year in all the years simulated with the inflatable dams operation. The flow of 5 cfs was used because it is the flow specified by the USFWS in the October 1993 draft Coordination Act Report as the minimum amount needed to maintain resident fish habitats. The inflatable dams would not generate additional quantities of water but they can prolong the flow duration and increase the number of minimum flow days between October through April. When the analysis compared historic recharge quantities, the results showed that the average recharge would increase by 1,000 AF per year which is $200,000 at $200 per AF with the inflatable dam operations. The inflatable dams would "capture" some of the water falling in the watershed below the reservoirs, which will otherwise flow directly to the bay. The inflatable dams are strategically located where only half of the drainage area of the river is controlled by the existing reservoirs. Table 3.18 showed the summary of the analysis results over the 6 years simulated and Figures 3.15 and 3.16 illustrate the flows in the Guadalupe River "with" and "without" the inflatable dams installed in a typical dry and wet years.

The District has been trying to improve the way we construct, remove, and operate our summer dams. The CDFG requires that less fine material be used in the construction of the gravel dams and that fish passage and cooler water downstream be provided. While this has been difficult in the past, the District's operations are currently completely satisfactory to CDFG. The inflatable dam however, would eliminate any possibility of sedimentation and turbidity problems associated with construction and removal of seasonal gravel dams as well as dam washout. It would also eliminate impacts to fisheries due to dewatering of ponds during installation and removal of the gravel dam and could be designed to provide fish passage and cooler water downstream. Ponded water could be released into the river during low flow periods between October and April and provide minimum desirable fishery flows for an additional 17 more days on average.

Impacts on special-status species occurring during the installation of the inflatable dams would be similar to those occurring during the seasonal gravel dams construction. However, long term impacts on special status species would be less than the gravel dams, because the construction period impacts would occur only once, rather than every year as the case with gravel dams. Because additional construction activities would not be expected after the foundation installation, there would be little or no disturbance to nesting raptors in the following years. The inflatable dams would result in reduced flooding and construction impacts to special-status species, and would result in less potential impacts to fisheries. Impacts to riparian habitat would also be similar to the installation of gravel dams.

This plan is not proposed at this time because the water rights issues and the process to appropriate and use the water are yet to be investigated.

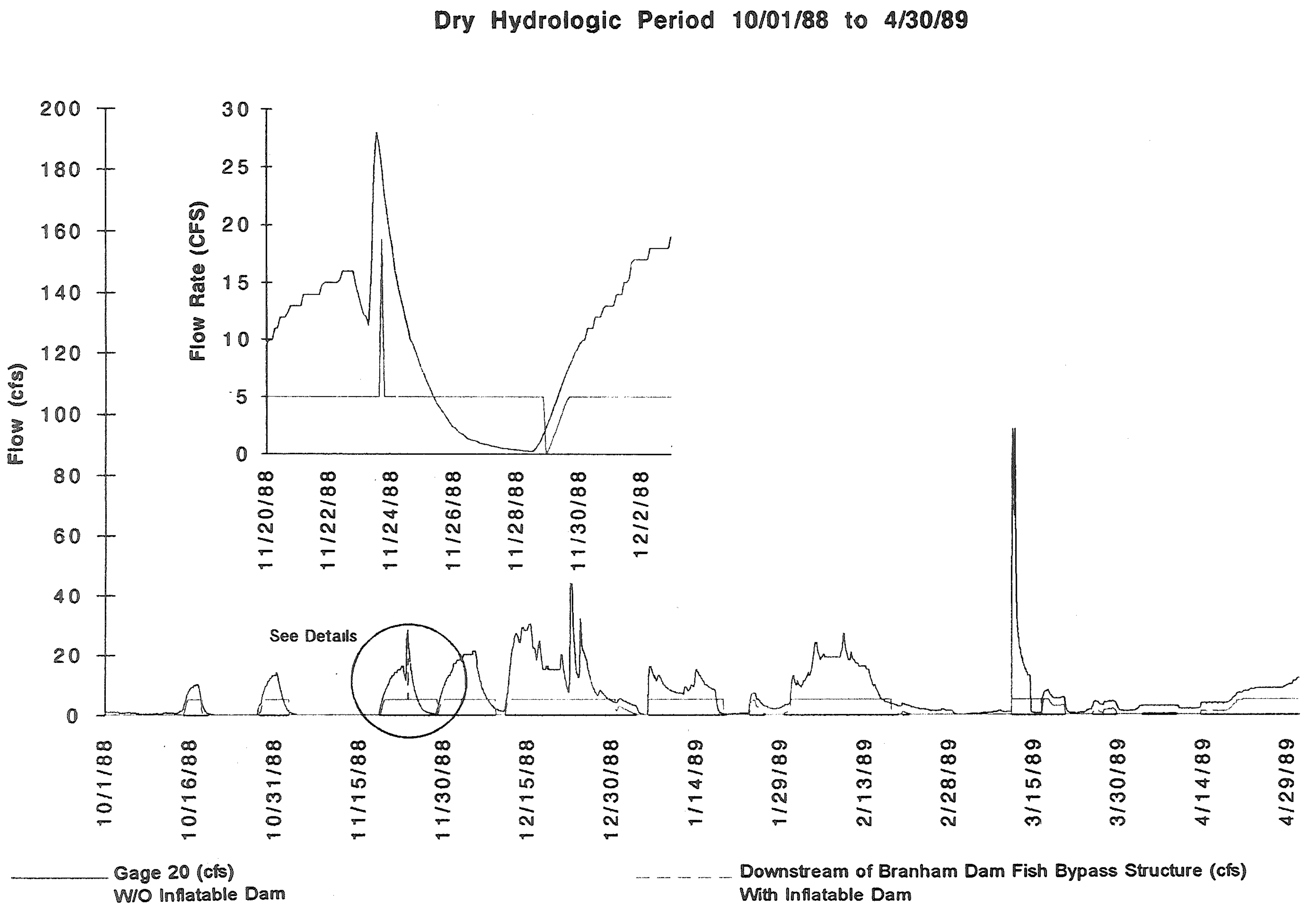


FIGURE 3.15: Flows in the Guadalupe River With and Without the Inflatable Dam Installation in a Typical Dry Year

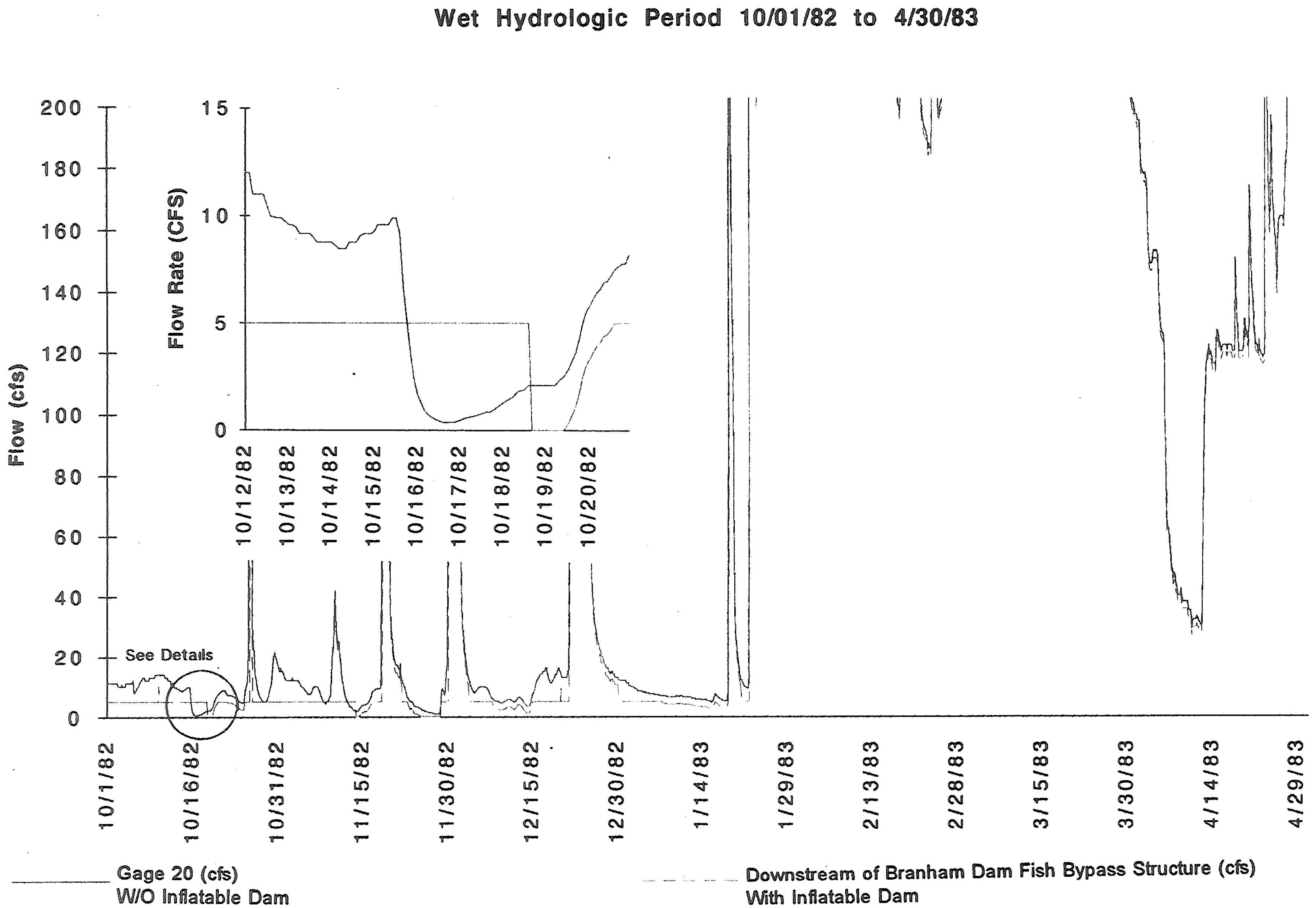

Wet Hydrologic Period 10/01/82 to 4/30/83

FIGURE 3.16: Flows in the Guadalupe River With and Without the Inflatable Dam Installation in a Typical Wet Year

TABLE 3.18

Summary of Hydrologic Analysis Results on the Proposed Inflatable Dam Operations

Simulate Time Period for Each Year October 1 Through April 30 (5,088 Hours)

			Resulting Recharge		5 cfs Delivered					Count Dam Status Changes	
Year	Year Type	Seasonal Rainfall (inches)	No Dams (acre feet)	Two Dams (acre feet)	No Dam (hours)	Upstream Blossom Hill Dam (hours)	Downstream Branham Dam (hours)	Upstream Blossom Hill Dam (hours inflated)	Downstream Branham Dam (hours inflated)	Upstream	Downstream
78-79	Average	12.76	842	1,645	2,354	2,929	2,640	2,658	4,447	6	10
82-83	Wet	30.25	1,041	1,381	4,004	4,482	4,302	1,010	2,293	4	11
83-84	Average	13.44	1,057	2,617	4,520	4,899	4,823	3,153	3,569	3	8
84-85	Average	12.63	979	2,140	2,470	3,323	3,348	4,714	5,077	1	2
88-89	Dry	8.32	745	1,740	1,758	2,193	2,205	3,799	5,088	1	0
91-92	Average	14.29	1,021	2,433	3,497	3,675	3,732	2,113	4,551	5	12
	Mean	16.67	948	1,993	3,101	3,584	3,508	2,908	4,171		
			Difference ≈ 1,000 af/year		Difference ≈ 400 hours, ≈ 17 days, ≈ 13% increase						

DESCRIPTION OF THE PREFERRED PROJECT

This section presents a detailed reach by reach description of the preferred project.

Project Overview

The preferred project can be divided into six major segments: (1) Reach A, which has inadequate freeboard and requires only minor channel modifications; (2) Reaches 6 through 8, where the existing natural river channel is very inadequate and a bypass channel is selected; (3) Reaches 9 and 10A, which is essentially a transition area between the upstream and downstream channels where channel widening, bank stabilization and revegetation are selected; (4) Reaches 10 through 12 where the existing river channel is nearly adequate for the majority of its length and only minor modifications are needed; and (5) Ross and Canoas Creeks, which are affected by the change in water surface in the Guadalupe River.

The preferred project and construction procedures are described in detail on the following pages and are shown on the plates located at the end of this report. The California construction BMP would be implemented during all construction activities. The following are some of the BMPs pertinent to this project (Stormwater Quality Task Force, March 1993).

BMP for Scheduling

The BMP for scheduling includes the following guidelines:

- Major grading operations would be scheduled during dry months.
- Sufficient time would be provided before rainfall begins to stabilize the soil with vegetation.
- The site would be stabilized year round from erosion and sediment build up.
- Only portions of the site would be disturbed at any one time, and grading would be completed immediately. Disturbed portions of the site would be stabilized prior to grading the next portions.
- As the work progresses, cut and fill slopes would be revegetated wherever feasible and appropriate.
- Trenching would be scheduled so that most open portions of the trench are filled before new trenching is begun.

BMP for Temporary Stream Crossings

The BMP for temporary stream crossings includes the following guidelines:

- Use of temporary stream crossings would not be allowed for general public traffic.
- Design of the crossings would be performed by a California registered engineer.

- The crossings would be sized and installed according to the drainage design criteria of the local municipality. Design criteria would be based on standard engineering practices with provisions for minimizing impacts on disturbed crossing areas.
- During summer construction where the stream is constantly dry, a ford is sufficient for temporary access. However, where the stream flows continuously throughout the year or where there are frequent rains, temporary culverts or bridges would be more appropriate. Where used, these culverts and bridges would be sized to pass a significant design storm.
- The temporary stream crossings would be protected against erosion, both to prevent excessive sedimentation in the stream and to prevent washout of the crossing.
- The stream crossing would be inspected weekly and after each significant rainfall. Silt would periodically be removed from crossings. Aggregate lost from inlets and outlets of culverts would be replaced.
- Construction of temporary stream crossings would be at or near the natural elevation of the streambed to prevent any potential flooding upstream of the crossing.

BMP for Preserving Existing Vegetation

The BMP for preserving existing vegetation at the site includes the following guidelines:

- Existing vegetation to be preserved would be flagged.
- The root system of trees to be preserved would be staked off prior to construction.
- The limits of grading or disturbance would be clearly marked at all times.
- Construction traffic routes and spoil piles will not be located where adverse impacts to the existing vegetation may occur.

BMP for Dust Control

The BMP for minimizing dust occurrence at the site includes the following guidelines:

- Key access points would be identified and stabilized prior to commencement of construction.
- Where possible, construction traffic would be directed to stabilized roadways within the project.
- Watering of dust prone areas would be frequent, but not excessive, to minimize the impact of dust particles.
- The number and activity of vehicles on a site at any given time would be controlled.
- Haul trucks transporting materials would be provided with covers.
- Sediment deposited on paved roads would be rapidly cleaned up.

BMP for Construction Road Stabilization

The BMP for stabilizing construction roads includes the following guidelines:

- Temporary access roads would be stabilized immediately after grading and maintained to prevent erosion and control dust.
- Gravel would be used for temporary roadways during rainy seasons and/or on slopes greater than 5 percent.
- The roadways would be carefully graded to drain transversely.

BMP for Stabilized Construction Entrance

The BMP for stabilizing temporary access roads includes the following guidelines:

- Access roads would be constructed on level ground where possible.
- The minimum depth of rock would be as recommended by a soils engineer.
- The minimum turning radii for entrance or exit to and from the temporary access road would follow the District's maintenance guidelines as set forth in Ordinance 83-2 (Appendix M).

BMP for Temporary Drains and Swales

The BMP for temporary drains and swales includes the following guidelines:

- Temporary drainage swales would be sized using local drainage design criteria. They would be designed so as not to adversely impact upstream or downstream properties.
- At a minimum, the drain/swale would conform to predevelopment drainage patterns and capacities.
- The drain/swale would be constructed with an uninterrupted, positive grade to a stabilized outlet.
- Energy dissipation measures will be provided if the flow out of the drain/swale can reach an erosive velocity.
- The drain/swale would be inspected weekly and after each rain for erosion or sediment build up.
- If there is a possibility for significant erosion to occur, the drainage swale would be stabilized using vegetation, chemical treatment, rock riprap, matting, or other physical means of stabilization.

Reach A: Highway 101 to Interstate 880—Floodwall/Levee

The current Caltrans plan in this reach is to construct the remaining portion of Highway 87 on an embankment up to 18 feet high. The plan includes excavating and lowering the east bank of the river from Airport Boulevard to I-880 to create a depressed bench for mitigation and maintenance access, and constructing future Skyport Drive Bridge.

The District would construct a floodwall up to 2 feet on the west bank and levee on the east bank from Highway 101 to Airport Island Bridge. In the interim, before Highway 87 is constructed, levees up to 2 feet high would be constructed on both the east and west banks from Airport Island Bridge to Airport Parkway Bridge. The proposed 15-foot wide maintenance road on the west top of bank would include underpasses for Highway 101, Airport Island Bridge, Airport Parkway Bridge, and future Skyport Drive Bridge (proposed by the City) and access ramps. All maintenance roads and ramps would be surfaced with 12 inches of aggregate.

All man-made or eye-sore materials on the banks would be removed only when there is no impacts associated with the removal and that the bank is stable. Soil investigation will be performed on the existing levees. If the levee is unstable, it will be reconstructed.

General Construction Procedures

Typical construction of the floodwall along Airport Boulevard just downstream of Airport Parkway Bridge would begin with trench excavation, followed by form work installation, concrete pouring, backfill, and aesthetic texturing on the face of the wall.

The construction of continuous access under bridges includes removal of channel bank lining upstream and downstream of the bridges, ramp construction and gabions installation. Coffer dams will likely be needed for most construction. The California Construction BMP would be implemented.

Possible staging area for the construction equipment would be at the top of the west bank upstream and downstream of Airport Island Bridge, Airport Parkway Bridge and Interstate 880 Overpass. Access to the construction area would be at Airport Island Bridge, Airport Boulevard, and Airport Parkway.

Reach 6: Interstate 280 to SPRR—Gabion Bypass Channel

Reach 6 extends from Interstate 280 to SPRR. At Interstate 280 overpass, the channel would be widened and the east bank lined with stepped gabions at a slope of 1:1 to conform to the future downstream channel improvements.

The proposed bypass channel's confluence is located just upstream of Interstate 280. A 4-foot drop structure at the confluence would be constructed of mattress gabions. The bypass channel proposed to the east of the river would be lined with stepped gabions at a slope of 1:1. The bypass channel would be 15 feet deep and 85 feet wide with a cross slope of 2 percent toward the river. The cross slope will create a low-flow area adjacent to the west bank. The bypass channel is designed such that low flows would continue in the natural channel.

A 120-foot wide three-span bridge would be constructed over the bypass channel at West Virginia Street. Stepped gabions with 1:1 side slopes would be constructed under the bridge.

Upstream of West Virginia Street, the bank between the bypass and the river would be lowered 8 feet for a length of 800 feet. During high flows, the low bank would be submerged connecting the bypass and river.

The lowered bank area and the top of east bank of the bypass channel would be planted with native riparian species. The stepped gabions would be planted by constructing tree wells.

A continuous maintenance road would be constructed at the top of bank between the existing creek and the bypass channel and in the bypass channel invert. Ramps would provide access to the bypass channel bottom. All maintenance roads and ramps would be surfaced with 12 inches of aggregate.

All man-made or eye-sore materials on the banks would be removed only when there is no impact associated with the removal and that the bank is stable.

Construction of Highway 87 has made the west bank of the natural creek into a levee conditions. The existing top of bank is low and needs 3.5 feet of freeboard to meet minimum FEMA requirements. A raised levee to provide the required freeboard would be constructed. A 12-foot wide maintenance road would be constructed on top of the levee. Soil investigation would be performed on the existing levee prior to preparation of construction plans. If the levee is unstable, it will be restabilized.

The bypass channel would require removal of 54 properties, one partial backyard area, and abandon McLellan Avenue. The intersections at West Virginia Street and Harliss Avenue, and McLellan and Edwards Avenues would be modified. The natural stream would remain undisturbed except at future unanticipated erosion sites.

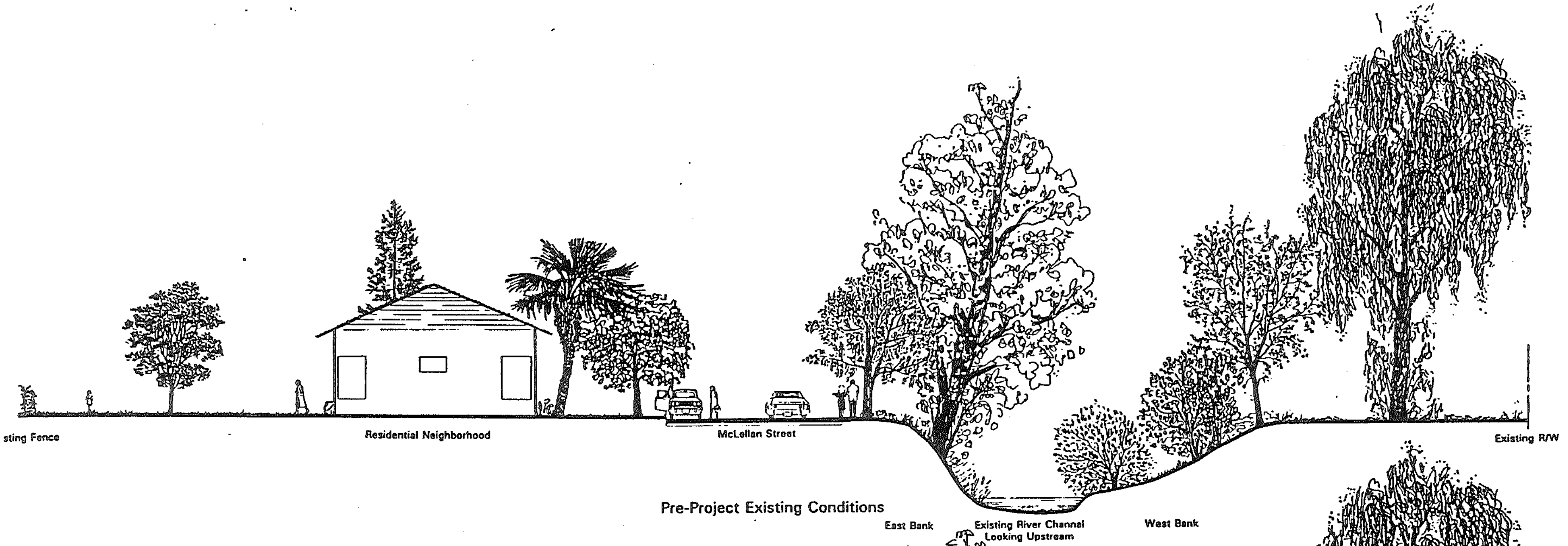
Typical sections for this reach are shown in Figure 3.17.

General Construction Procedures

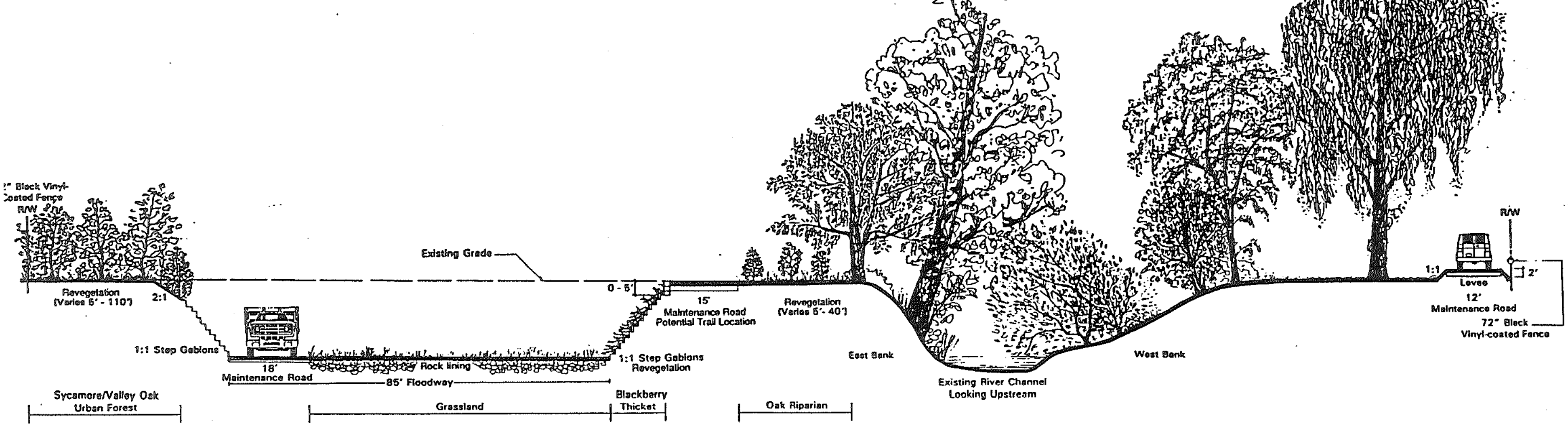
Typical construction of a bypass channel would begin with installation of temporary construction fences and warning signs, followed by removal of pavement, vegetation and fences, demolition of buildings and other existing structures, and relocation of existing utilities.

After relocation of utilities, the bypass channel would be excavated. The bypass channel bottom would be graded and rock lined. On the channel slopes, stepped gabions would be installed and backfill would be compacted behind the gabions. Coffer dams will likely be needed for most construction. The California Construction BMP would be implemented.

Construction of the bypass channel would also include constructing a new bridge at West Virginia Street which involves traffic control, excavation, piling, form work installation, concrete pouring, backfill, and pavement construction.



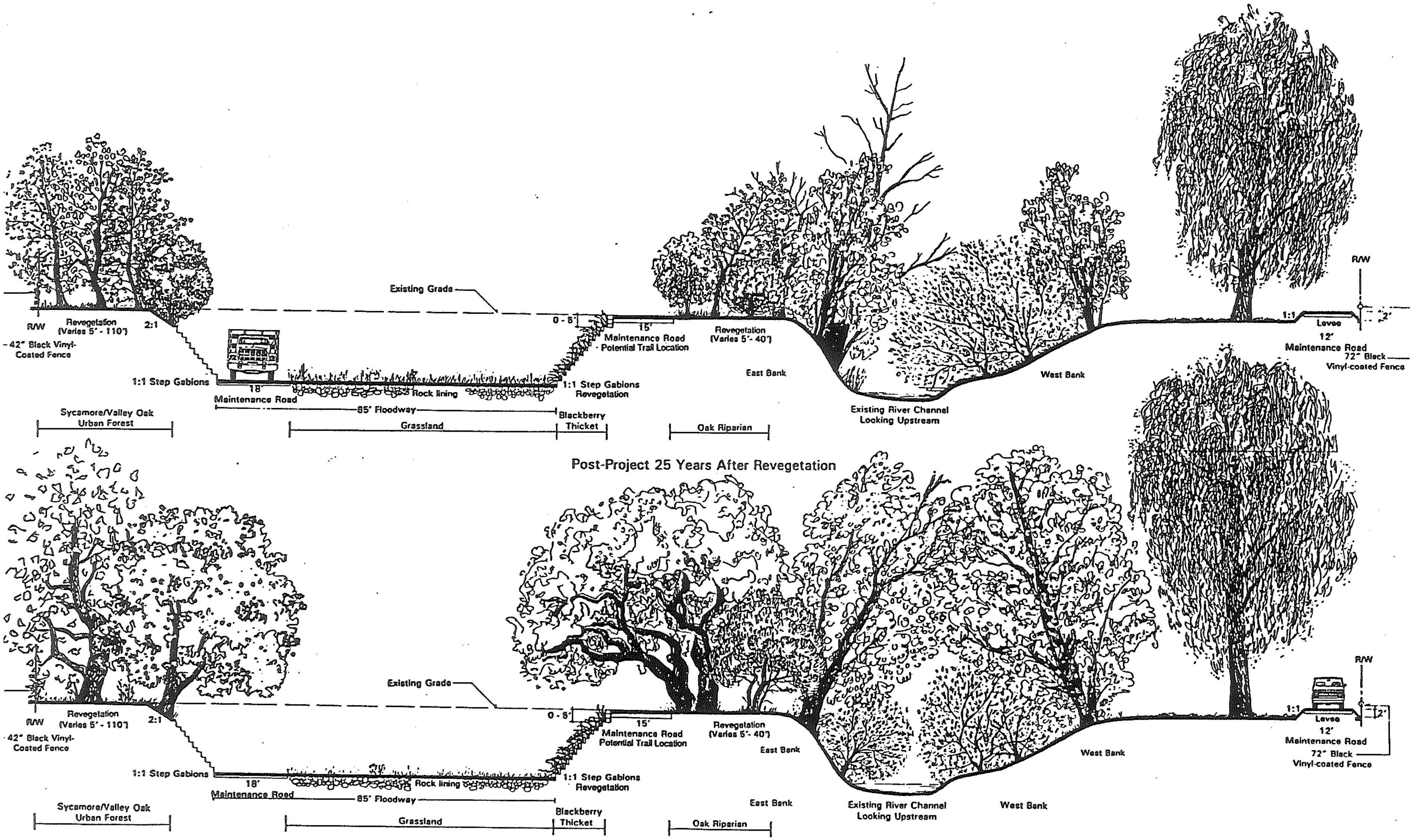
Pre-Project Existing Conditions



Post-Project 5 Years After Revegetation

Typical Section of Revegetation: 6 A - 6 A'
REACH 6: From Station 718 + 50 to Station 725 + 00

FIGURE 3.17


Existing Grade
R/W
Revegetation (Varies 5' - 110')
2:1
42" Black Vinyl-Coated Fence
1:1 Step Gabions
18'
Maintenance Road
Rock lining
85' Floodway
0 - 5'
15'
Maintenance Road Potential Trail Location
1:1 Step Gabions Revegetation
Blackberry Thicket
Revegetation (Varies 5'- 40')
East Bank
Existing River Channel Looking Upstream
West Bank
R/W
1:1
Levee
2'
12' Maintenance Road
72" Black Vinyl-coated Fence
Sycamore/Valley Oak Urban Forest
Grassland
Oak Riparian

Post-Project 25 Years After Revegetation

Existing Grade
R/W
Revegetation (Varies 5' - 110')
2:1
42" Black Vinyl-Coated Fence
1:1 Step Gabions
18'
Maintenance Road
Rock lining
85' Floodway
0 - 5'
15'
Maintenance Road Potential Trail Location
1:1 Step Gabions Revegetation
Blackberry Thicket
Revegetation (Varies 5'- 40')
East Bank
East Bank
Existing River Channel Looking Upstream
West Bank
West Bank
R/W
1:1
Levee
2'
12' Maintenance Road
72" Black Vinyl-coated Fence
Sycamore/Valley Oak Urban Forest
Grassland
Oak Riparian

Post-Project 75 Years After Revegetation

Typical Section of Revegetation: 6 A - 6 A'
REACH 6: From Station 718 + 50 to Station 725 + 00

FIGURE 3.17 (CONT'D)

Construction of levee on the west bank of the natural stream channel would consist of clearing and grubbing, placing and compacting material from bypass channel excavation for the levee, and constructing a maintenance road on top of the levee.

Revegetation areas in this reach would be planted with riparian plant species as designated in the mitigation plan after all construction activities are completed; typically this would be done in fall for the best survival rates.

Possible staging area for the construction equipment would be within the proposed right of way of the bypass channel or in revegetation areas. Access to the construction area would be at Palm Street, West Virginia Street, and Edwards Avenue.

Reach 7: SPRR to Union Pacific Railroad—Gabion Bypass Channel

Reach 7 extends from SPRR to UPRR. A four-cell 20 x 18-foot RCB culvert would be constructed under SPRR. From SPRR to Willow Street, the bottom width of the bypass channel varies from 65 to 85 feet under the Highway 87 bridge. Stepped gabions are proposed on the banks with a slope of 1:1 and rock would be placed on the bottom of the bypass channel. The invert would be sloped 2 percent towards the west bank to create a low-flow channel. The bypass channel would be designed such that low flows would continue in the natural channel.

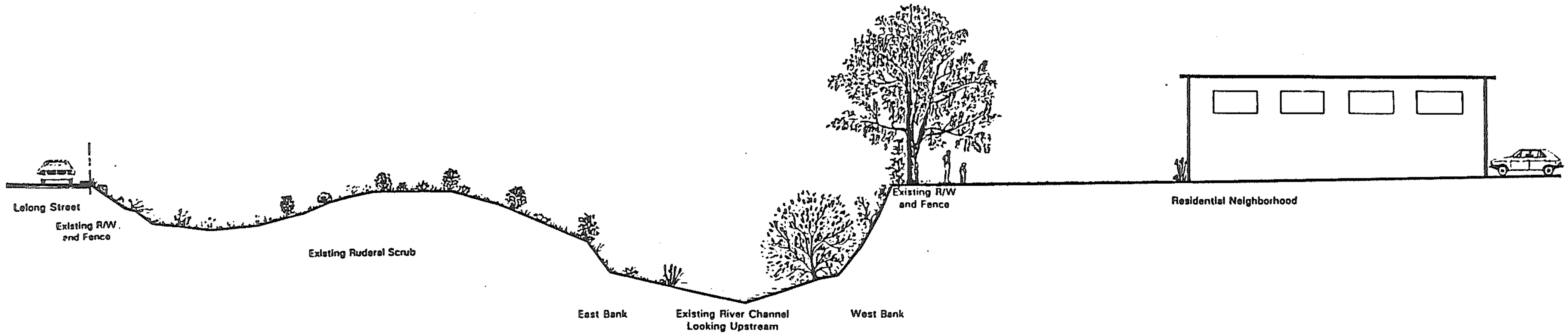
A three-span bridge would be constructed over the bypass channel at Willow Street. From Willow Street to about 300 feet upstream, the bottom width would be 85 feet with stepped gabion bank lining at a 1:1 side slope. Adjacent to Lelong Street, the channel bottom width would be reduced to 30 feet with the side slopes 1:1.

Ramps would be provided on the east bank of the bypass to allow access from Willow Street to the 18-foot maintenance road located on the bottom. Between Willow Street and Alma Avenue, a continuous maintenance road would be constructed at the top of bank between the existing creek and the bypass and at the bottom of the bypass channel on the east. All maintenance roads and ramps would be surfaced with 12 inches of aggregate.

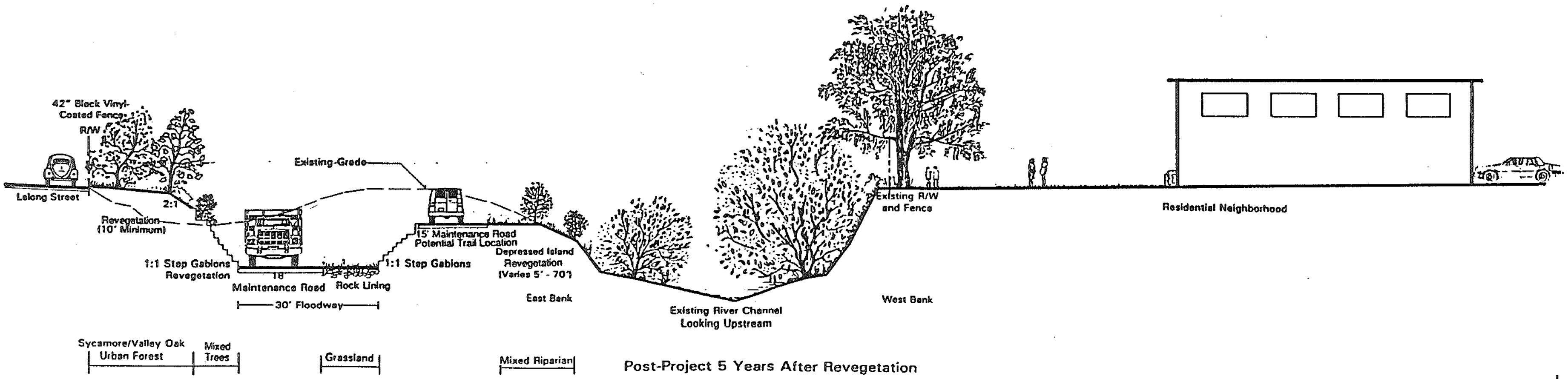
All man-made or eye-sore materials on the banks would be removed only when there is no impact associated with the removal and that the bank is stable.

The bank between the existing channel and the bypass channel would be lowered about 10 feet from Willow Street to Alma Avenue. These lowered areas would be submerged, connecting the two channels during high flows. The lower banks would be revegetated. From Alma Avenue to UPRR, a gabion bypass channel with a 7-foot high floodwall on the east bank would be constructed. Parking area losses will be replaced in coordination with the Elk's Lodge. (A short floodwall would be constructed just downstream of Alma Avenue along Lelong Street for 300 feet.)

The bypass channel construction would require the acquisition of a commercial site upstream of Willow Street between Lelong Street and the existing channel. An easement would be required across the Elk's Lodge parking lot for the bypass channel. The natural stream would remain undisturbed except at future unanticipated erosion sites.



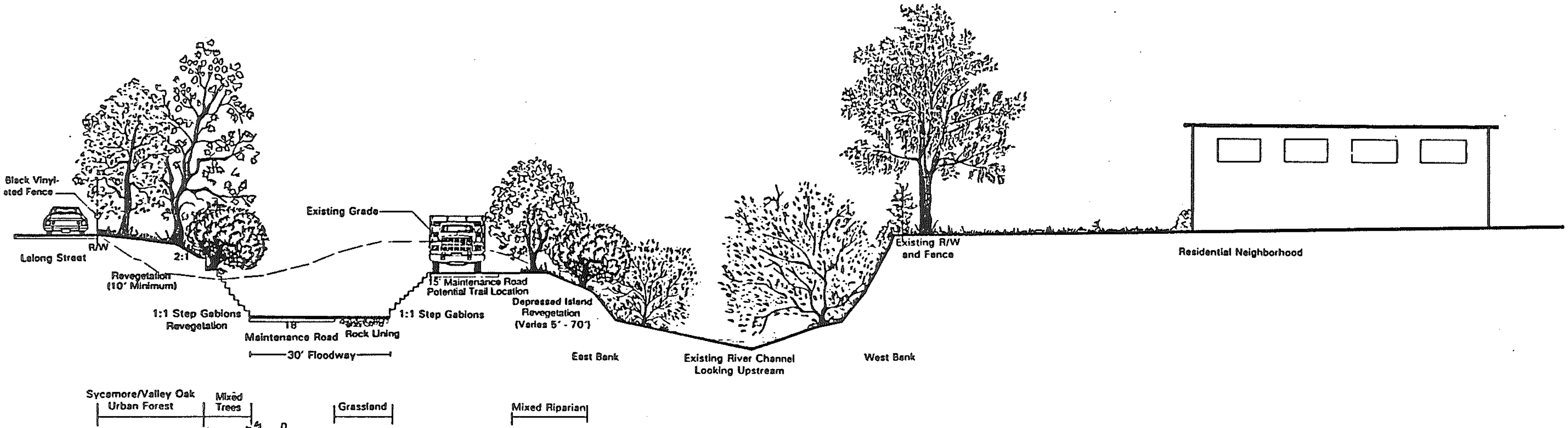
Pre-Project Existing Conditions


42" Black Vinyl-Coated Fence
R/W
Lelong Street
2:1
Revegetation (10' Minimum)
1:1 Step Gabions Revegetation
18'
Maintenance Road
Rock Lining
30' Floodway
Existing-Grade
1:1 Step Gabions
15' Maintenance Road Potential Trail Location
Depressed Island Revegetation (Varies 5' - 70')
East Bank
Existing River Channel Looking Upstream
West Bank
Existing R/W and Fence
Residential Neighborhood
Sycamore/Valley Oak Urban Forest
Mixed Trees
Grassland
Mixed Riparian

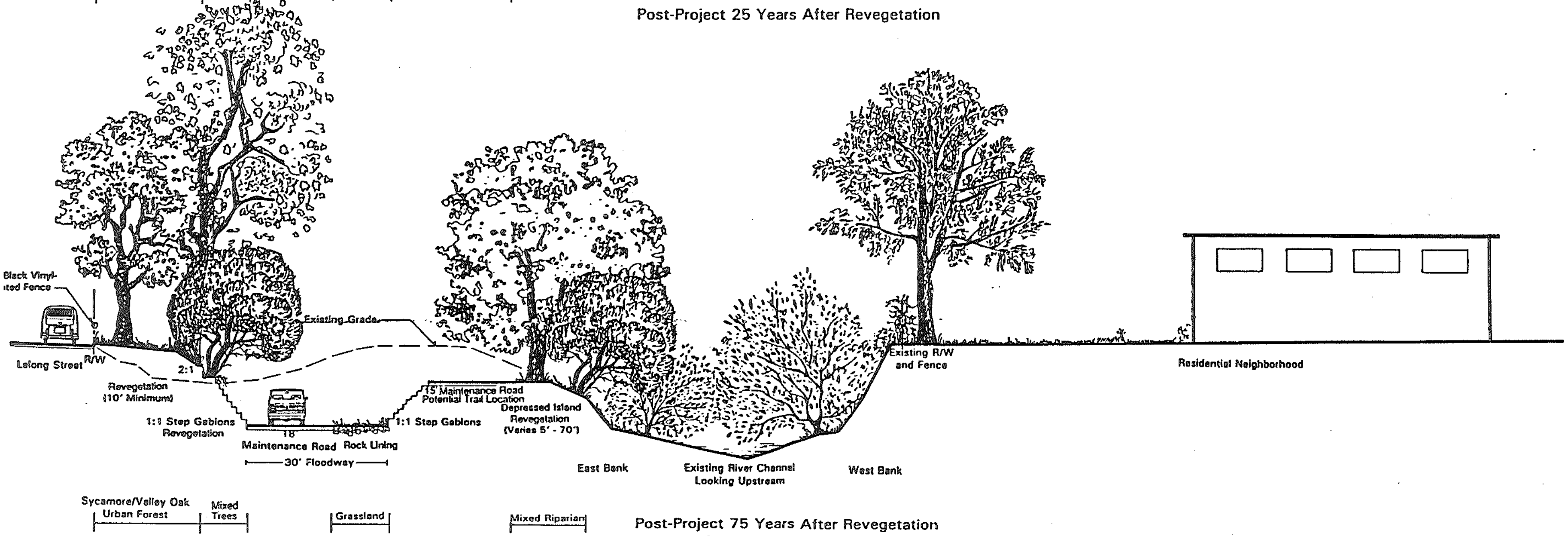
Post-Project 5 Years After Revegetation

Typical Section of Revegetation: 7 B - 7 B'
REACH 7: From Station 760 + 00 to Station 770 + 00

FIGURE 3.18



Post-Project 25 Years After Revegetation



Post-Project 75 Years After Revegetation

Typical Section of Revegetation: 7 B - 7 B'

REACH 7: From Station 760 + 00 to Station 770 + 00

FIGURE 3.18 (CONT'D)

Erosion is active on the west bank between Willow and Alma Streets. A new erosion site was observed, a length of 450 feet, upstream of Willow Street after the January and March 1995 floodings. Specific measures to repair and protect this site will follow the maintenance program proposed in this report. The potential method could be rock riprap, which consists of placing rock riprap on the bank slope and soil can be placed between the rocks and planted by live staking.

Typical sections for this reach are shown in Figure 3.18.

General Construction Procedures

Construction of the bypass channel, the new bridge at Willow Street and Alma Avenue, and the levee just upstream of Alma Avenue would be as described for in Reach 6.

The RCB culverts under SPRR and UPRR would be jacked. Typically, the box culverts would be constructed on site and later jacked under the railroads by pushing or pulling on either side of the crossings. If the Southern Pacific and Union Pacific Transportation Companies would allow track closure for temporary bridge installation, then the jacking method would not be used. Installation of a temporary bridge would involve raising the track profile, driving of piles, removing both existing tracks, installing shoring and placing of structural steel beams and diaphragms. After the temporary bridge construction, tracks would be reinstalled, including rails, ties and ballast. Coffer dams will likely be needed for most construction. The California Construction BMP would be implemented.

The contractor would conduct his operation adjacent to the Railroad facilities and within the Railroad right of way in such a manner to maintain the structures and the area in a good and safe condition.

The contractor would comply with the Railroad's rules, regulations, and instructions governing the use of signals and flags for signaling or flagging trains,. as a protection against accidents, and governing the protection of tracks and property of Railroad and the traffic moving on such tracks, as well as wires, signals, and other property, at or in the vicinity of the construction area.

Floodwall construction along Lelong Street just downstream of Alma Avenue and at the Elk's Lodge would consist of trench excavation, form work installation, concrete pouring, backfill and aesthetic texturing on the face of the wall.

Revegetation areas in this reach would be planted with riparian plant species as designated in the mitigation plan after all construction activities are completed; typically this would be done in fall for the best survival rates.

Possible staging area for the construction equipment would be within the proposed right of way of the bypass channel or in revegetation areas. Access to the construction area would be at Willow Street, along Lelong Street, and Alma Avenue.

Reach 8: UPRR to Willow Glen Way—Gabion Bypass Channel

Reach 8 extends from UPRR to Willow Glen Way. The bypass channel is constructed to the east of the river and has a an 85-foot bottom width with 1:1 stepped gabion side slopes. The bottom of the bypass will have a cross slope of 2 percent towards the west bank to create a low-flow channel. A triple-cell 20- by 17-foot RCB culvert would be constructed under UPRR which continues downstream under the Elk's Lodge parking lot.

The construction would require the removal of 23 properties on the west side of Mackey Avenue. Existing sidewalks and street trees on Mackey Avenue would not be affected by construction. The intersection of Mackey Avenue, Willow Glen Way, and Northern Road would be improved such that Northern Road would end at Mackey Avenue, and Mackey Avenue would extend to Willow Glen Way. It is anticipated that the District will enter an agreement with the City to cost share on the streets realignment. The natural stream would remain undisturbed except at future unanticipated erosion sites.

A maintenance road would be located in the bypass channel invert. Ramps would be provided to access to the depressed maintenance roads at the upstream and downstream ends of the reach. The maintenance roads and ramps would be surfaced with 12 inches of aggregate.

The entrance to the bypass would be located downstream of Willow Glen Way. During the 1 percent flow, the bypass inlet structure would be designed to divert 9,600 cfs leaving 5,000 cfs to flow in the existing channel. A weir structure in the bypass channel would control the amount of flow entering the bypass channel for a given water surface elevation in the existing channel. The existing channel capacity is controlled by constrictions at Alma Avenue, UPRR and by heavy vegetation. Any potential variation in flow rates, however, would not affect the hydraulics in the lower reaches. The weir structure would be designed such that low flows would continue in the natural channel.

All man-made or eye-sore materials would be removed only when there is no impacts associated with the removal and that the bank is stable.

The weir structure would be located near the Willow Glen Way bridge and would be constructed of stepped gabions. The invert of the drop structure would be designed such that flow less than approximately 1500 cfs would continue in the natural channel. This would reduce the probability of fish being stranded in the bypass channel. Construction of the diversion structure may require a physical model analysis.

The invert of the bypass channel would be up to 4 feet higher than the existing channel bottom. The existing channel east bank would be protected from high velocities by placing rock from the toe to the top of bank for about 30 feet downstream of the entrance.

The stepped gabions on the banks will be planted with appropriate riparian species.

Typical sections for this reach are shown in Figure 3.19.

General Construction Procedures

Construction of the bypass channel would be as described for in Reach 6.

Construction of the gabion diversion structure located just downstream of Willow Glen Way would consist of trench excavation, gabion installation, and back fill. Water flowing in the river may be blocked and diverted from around the construction area using pumps and pipes.

Coffer dams will likely be needed for most construction. The California Construction BMP would be implemented.

Possible staging area for the construction equipment would be within the proposed right of way of the bypass channel or in revegetation areas. Access to the construction area would be at Mackey Avenue and Willow Glen Way.

Revegetation would be as described for Reach 7.

Reaches 9 and 10A: Willow Glen Way to Southbound Almaden Expressway—Widened Cribwall Channel

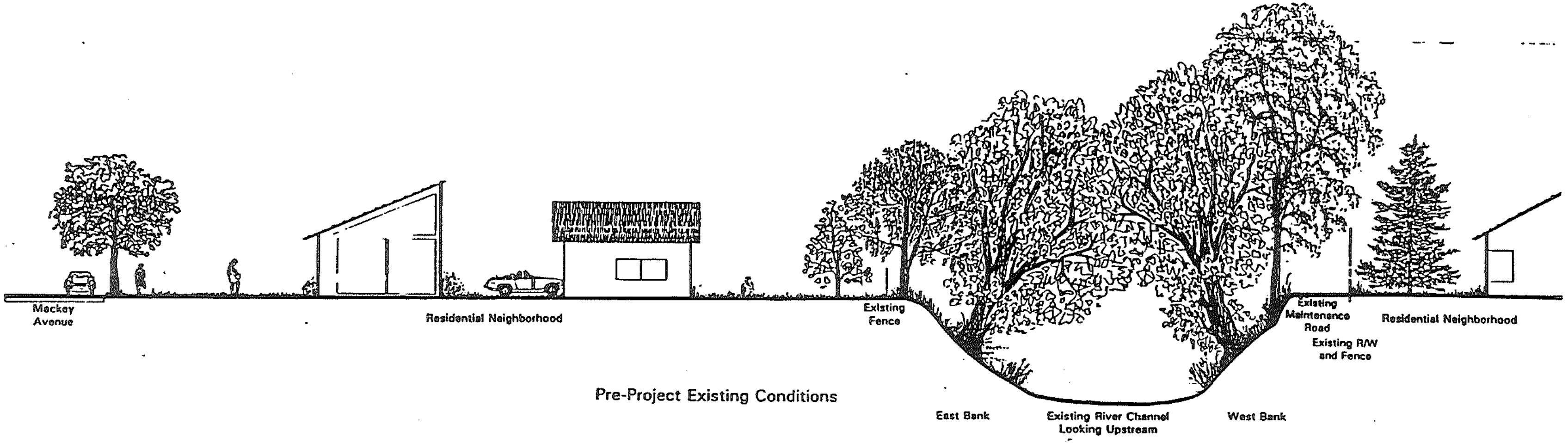
Reach 9 extends from Willow Glen Way to Curtner Avenue and Reach 10A extends from Curtner Avenue to southbound Almaden Expressway. The bridge at Willow Glen Way would be replaced with a 120-foot wide bridge. An 18-foot wide depressed maintenance road would be located on the east bank under the bridge 10 feet above the channel bottom. The east bank would be protected with stepped gabions on a 1:1 slope and the west bank would conform to existing sacked concrete slopes upstream and downstream of the bridge. It is anticipated that the District will enter an agreement with the City to cost share on the new bridge.

From Willow Glen Way to the SJWC property (700 feet upstream), the east bank would be widened to 70 feet creating a bench 5 to 12 feet above the channel bottom. Existing wells and associated facilities on the SJWCO property within the construction impact area will be relocated. Location of the new wells would be coordinated with the SJWCO in advance of channel construction. The west bank and the lower east bank would be undisturbed. An 18-foot maintenance road and 22-foot wide floodway would be located on the depressed bench. The remainder of the bench would be revegetated. The bench would slope 2 percent towards the existing channel for drainage.

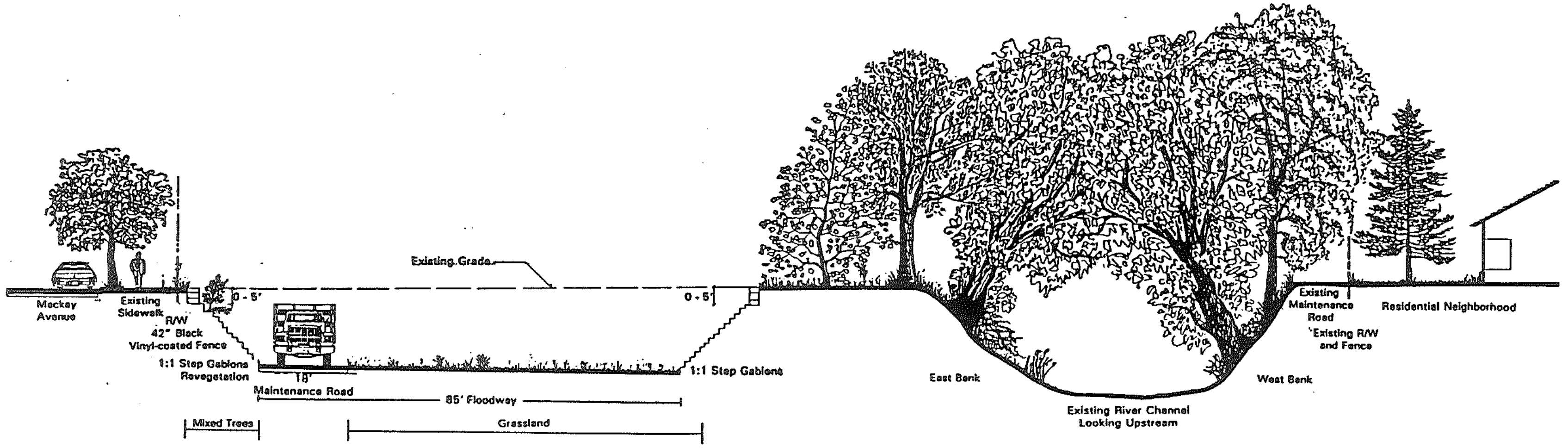
A 500-foot bypass channel (Pine bypass) would be constructed upstream of the SJWC property. The bottom width of the bypass channel would be 40 feet and the elevation would be 9 feet above the channel bottom. The east and west banks of the bypass channel would be protected with stepped gabions on a 1:1 slope to conform to the slopes of upstream and downstream depressed bench. The depressed maintenance road would continue along the east toe of the slope. Six properties, two partial backyard areas, and two businesses would be removed to construct the bypass channel. The top of east bank of the bypass channel would be planted with native plants. The natural channel would be undisturbed except at future unanticipated erosion sites.

An excavated bench would continue upstream of the bypass channel and ends as the depressed maintenance road ramps up to Almaden Road. The upper and lower east banks would be protected with stepped gabions on a 1:1 slope. The existing east bank SCSP in the vicinity would be replaced with cribwalls. The west bank would be undisturbed except at future unanticipated erosion sites.

Along Almaden Road, the channel would be widened to the east and the bank would be protected with cribwalls. The channel widening is constricted by the Almaden Road and its future widening. A maintenance road would be located on the depressed bench. A maintenance ramp from Almaden Road would provide access to the bench. The west bank would be undisturbed except at future unanticipated erosion sites.



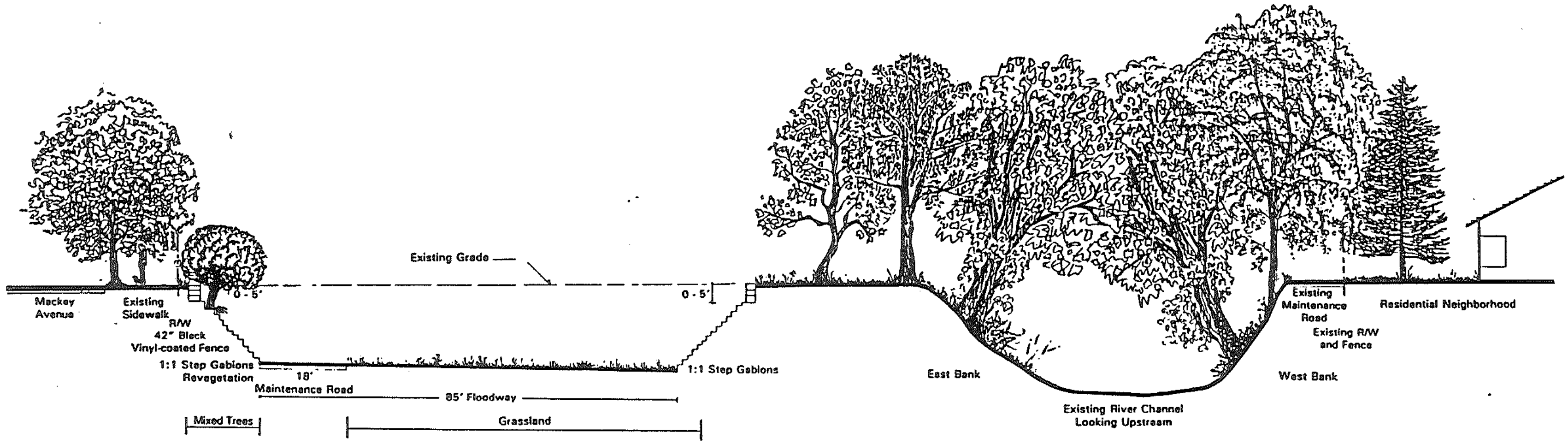
Pre-Project Existing Conditions



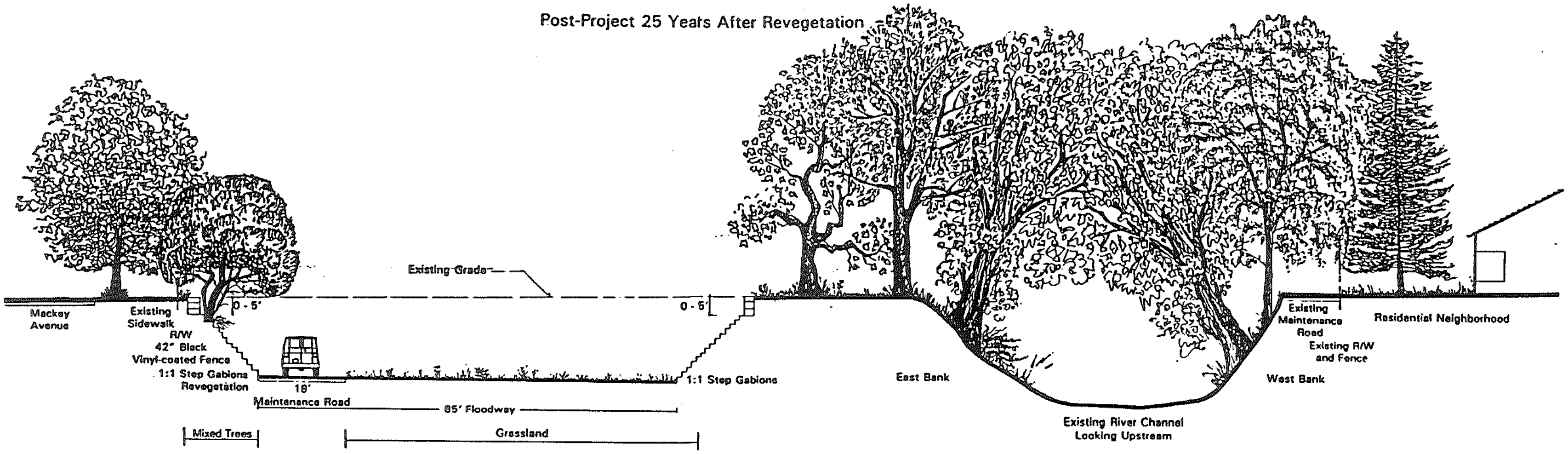
Post-Project 5 Years After Revegetation

Typical Section of Revegetation: 8 C - 8 C'
REACH 8: From Station 786 + 00 to Station 791 + 00

FIGURE 3.19



Post-Project 25 Years After Revegetation



Post-Project 75 Years After Revegetation

Typical Section of Revegetation: 8 C - 8 C'
REACH 8: From Station 786 + 00 to Station 791 + 00

FIGURE 3.19 (CONT'D)

The Malone Road bridge was constructed by the City in 1989 and would require no further structural improvements. Upstream of Malone Road, the concrete on the east bank would be replaced with cribwalls and a depressed bench would be constructed which would continue through the bridge.

As the river meanders away from Almaden Road, a 500-foot long bypass channel (Malone bypass) would be constructed. The bypass channel would have a bottom width of 40 feet and would be 5 feet above the channel bottom. The east bank would be protected with cribwalls and the west with stepped gabions. Several large sycamore trees at the top of the existing east bank would be preserved. The natural channel would be undisturbed except at future unanticipated erosion sites.

At the remainder of the reach, the channel would be widened to the east creating a bench varying in width from 18 feet to 40 feet and 5 to 6 feet above the channel bottom. The lower east bank would remain as existing and the upper bank would be protected with cribwalls on a 1:6 side slope. An 18-foot maintenance road would be located on the bench. A portion of the bench would be planted with riparian vegetation. The west bank would be undisturbed except at future unanticipated erosion sites.

All man-made or eye-sore materials would be removed when there is no impacts associated with the removal and that the bank is stable.

The Curtner Avenue bridge would be replaced with a three-span bridge. The maintenance road would continue under the new bridge and have a turn around near Almaden Expressway.

Erosion is active on the west bank near Pine Avenue and on a 250-foot length of bank upstream of Malone Road. These sites would be repaired with stepped gabions conforming to the existing slopes. Two new erosion sites were observed, a total length of 500 feet, downstream of Curtner Avenue, after the January and March 1995 floodings. Specific measures to repair and protect these sites will follow the maintenance program proposed in this report. The potential method could be rock riprap, which consists of placing rock riprap on the bank slope with soil being placed between the rocks and planted by live staking.

Vortex rock weir will be installed at the meandering section of the channel, downstream of a sharp bent. The rock weir will be constructed with large boulders vary from 3 to 5 feet in diameter and will be keyed into the bank to eliminate erosion. The weir is constructed in a U-shape, with the point of the "U" facing upstream and span at the minimum the bankfull channel width. This forms a vortex that creates a downstream plunge pool for energy dissipation and aquatic habitat. Footer rocks will be installed for anchoring and prevent undermining.

The weir will provide instream cover and deepen the feeding areas for fish habitat in the riffle reach of the channel. It acts as a grade control structure without upstream lateral migration, bank erosion and aggradation. It also maintains a low width to depth ratio channel which will reduce the likelihood of bar deposition and maintains the sediment transport capacity of the stream.

Typical sections for these reaches are shown in Figures 3.20 and 3.21.

General Construction Procedures

Construction of the two short bypasses (Pine and Malone Islands), and Willow Glen Way and Curtner Avenue Bridges would be as described for in Reach 6. Water flowing in the river during bridge construction may be blocked and diverted around the construction area using pumps and pipes. Coffer dams will likely be needed for most construction. The California construction BMP would be implemented.

Prior to channel excavation at the SJWC, existing wells and associated facilities in the construction area would be relocated. Locations of the new wells would be coordinated with the SJWC in advance of channel construction. A temporary shoring system would be installed to stabilize the bank and adjacent ground during channel excavation. The shoring system could consist of sheet piles or soldier piles with lagging.

After installation of the shoring system, the bank would be excavated to widen the channel. The widened depressed bench would be graded and stepped gabions and cribwalls would be installed on the channel slope. Along Almaden Road, the contractor would provide temporary railing between the traffic lane and excavation or storage area. There will be traffic control and possibly detours required for construction of cribwall. All works would be coordinated with the City. Excavation would most likely be performed from the depressed bench.

Possible access to the erosion site at Pine Avenue would be from the channel invert and Pine Avenue. The eroded bank would be sloped back for stepped gabion installation, and backfill would be compacted behind the gabions. Water flowing in the river may be blocked and diverted around the construction area using pumps and pipes.

Possible access to the erosion site upstream of Malone Road would be from the channel invert. Stepped gabion installation on the bank would be as described for Pine Avenue.

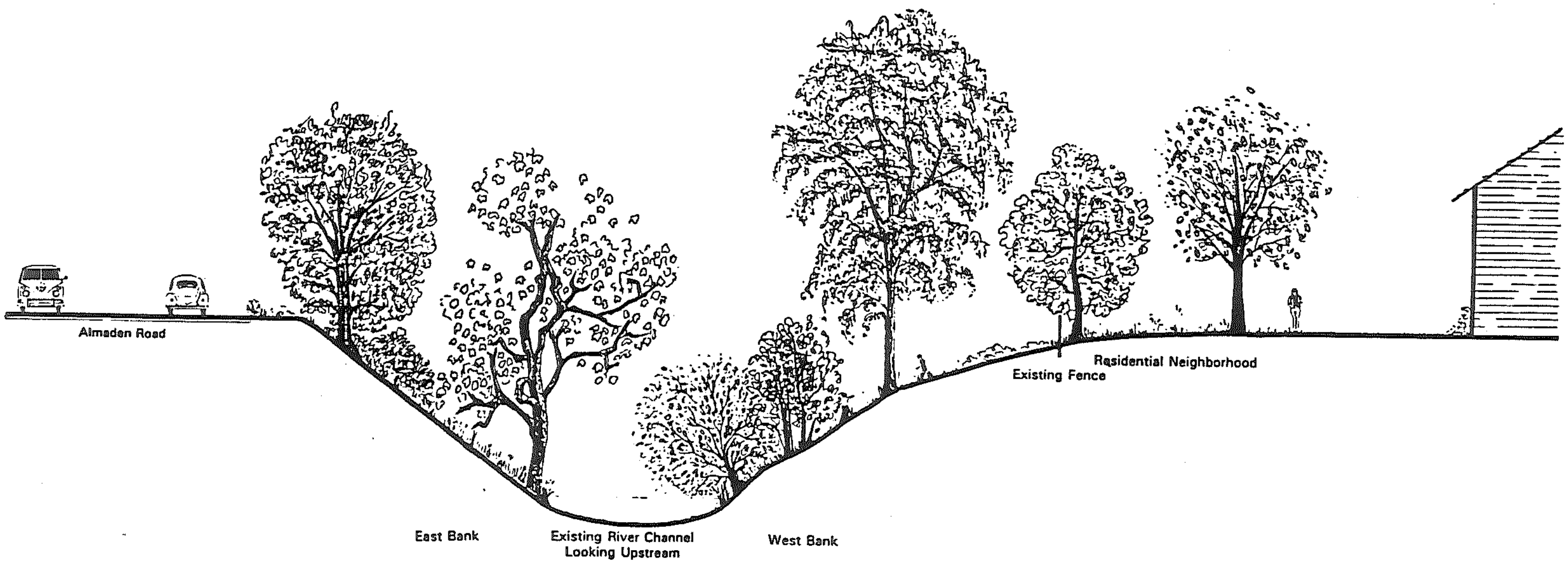
Revegetation areas in this reach would be planted with riparian plant species as designated in the mitigation plan after all construction activities are completed; typically this would be done in fall for the best survival rates.

Staging area for the construction equipment would be at Pine and Malone Islands. Access to the construction area would be at Willow Glen Way and along Almaden Road.

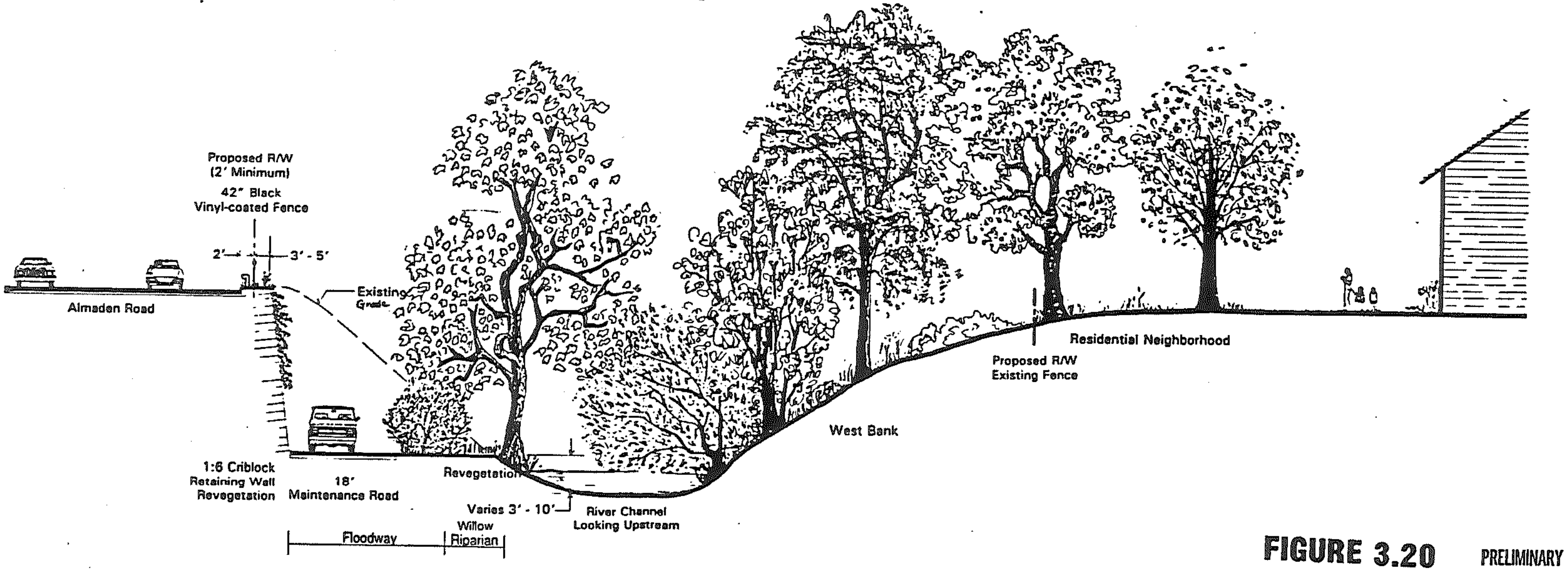
Reaches 10B and 10C: Southbound Almaden Expressway to Capitol Expressway—Levee and Widened Gabion Channel

Reach 10B extends from southbound Almaden Expressway to Stream Flow Gage Station No. 23B and Reach 10C continues to Capitol Expressway. Reach 10B is adequate to contain the 1 percent flow except between southbound and northbound Almaden Expressway. In this area, the west bank does not have adequate freeboard. A levee would be constructed up to 4 feet high with a top width of 12 feet and 2:1 side slopes. The alignment would meander to avoid trees. A 4-foot floodwall would be constructed at the Lincoln Avenue overpass and conform to the levee. At the channel invert, a 5-foot wide riparian vegetation corridor would be planted; the low-flow channel would be constructed.

Upstream of northbound Almaden Expressway a maintenance road would be established on the existing east bench. Portions of the bench would be excavated to provide a larger revegetation area. Existing rock lining at the channel bottom would be relocated and reformed to create bankfull and low-flow channels. A ramp just upstream of northbound Almaden Expressway would provide access to the maintenance road.



Pre-Project Existing Conditions



Post-Project 5 Years After Revegetation

Typical Section of Revegetation: 9 D - 9 D'
REACH 9: From Station 831 + 00 to Station 842 + 00
East Bank Widening

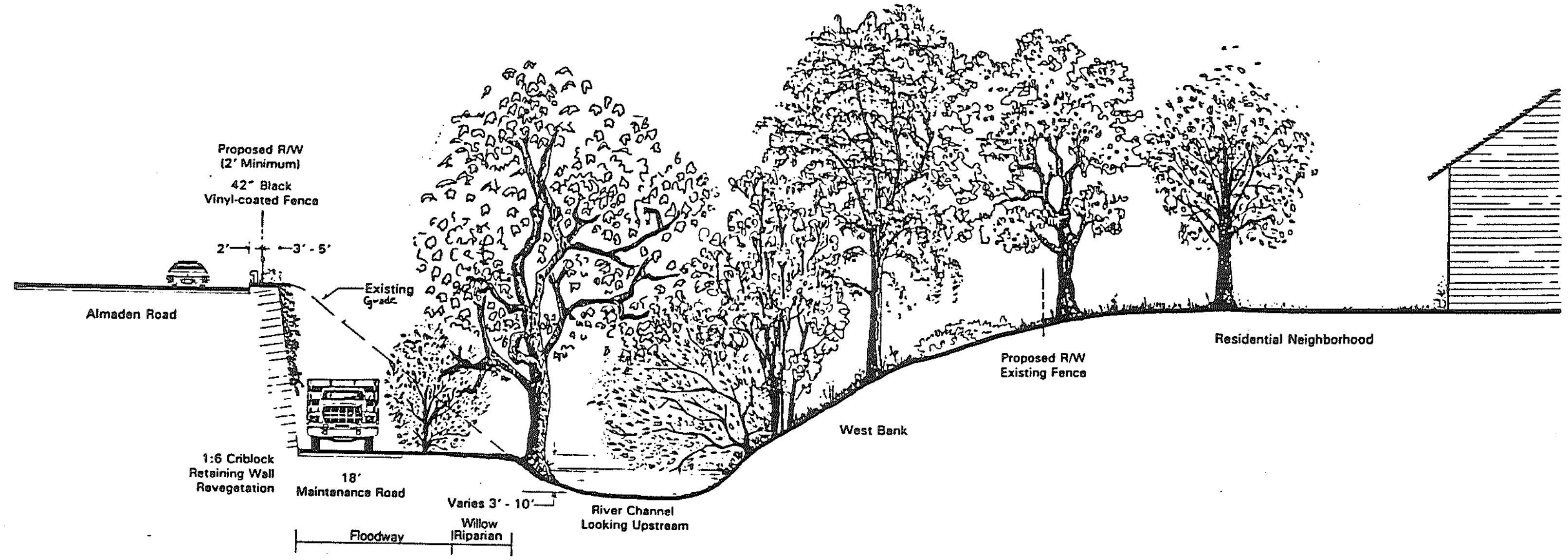
FIGURE 3.20

PRELIMINARY

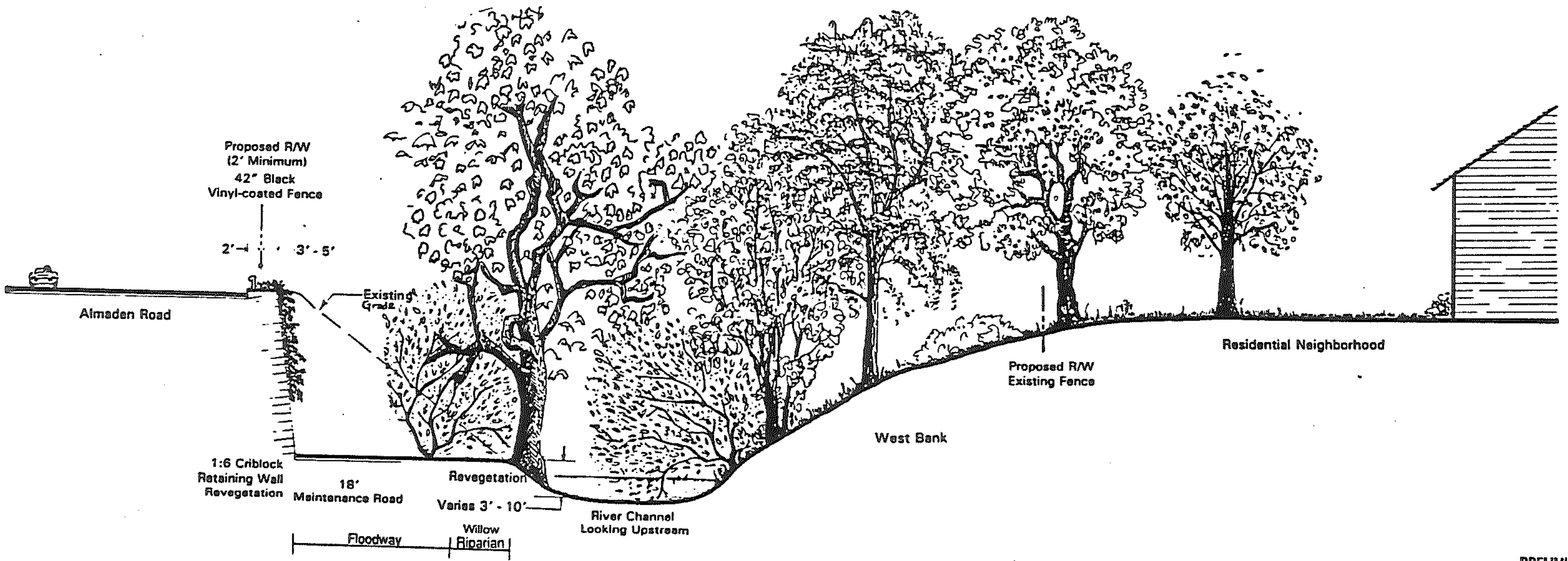
MAY 08 1995

SUBJECT TO
REVISION

5'
10'



Post-Project 25 Years After Revegetation

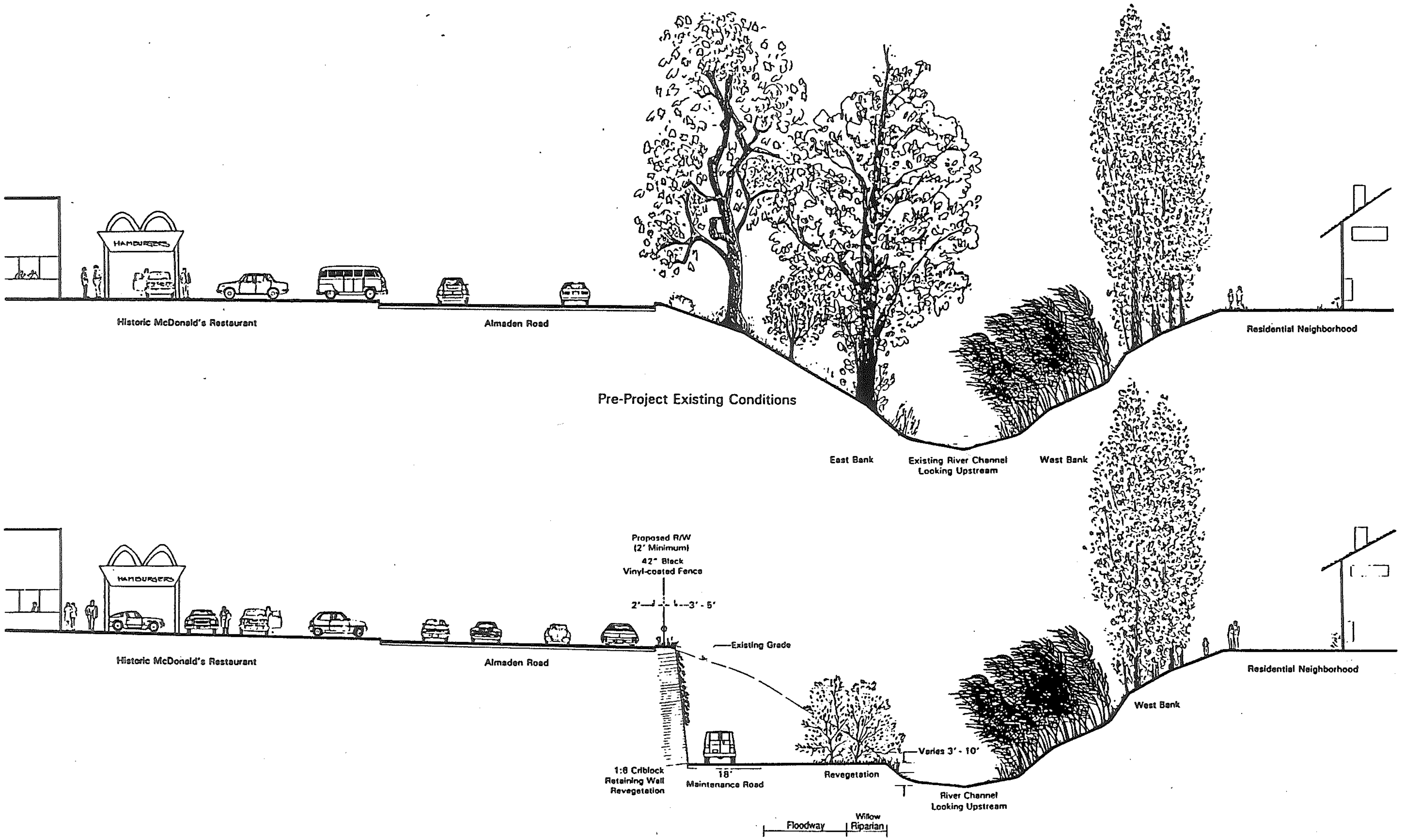


Post-Project 75 Years After Revegetation

Typical Section of Revegetation: 9 D - 9 D'
REACH 9: From Station 831 + 00 to Station 842 + 00
East Bank Widening

FIGURE 3.20 (CONT'D)

PRELIMINARY
MAY 08 1995
SUBJECT TO
REVISION

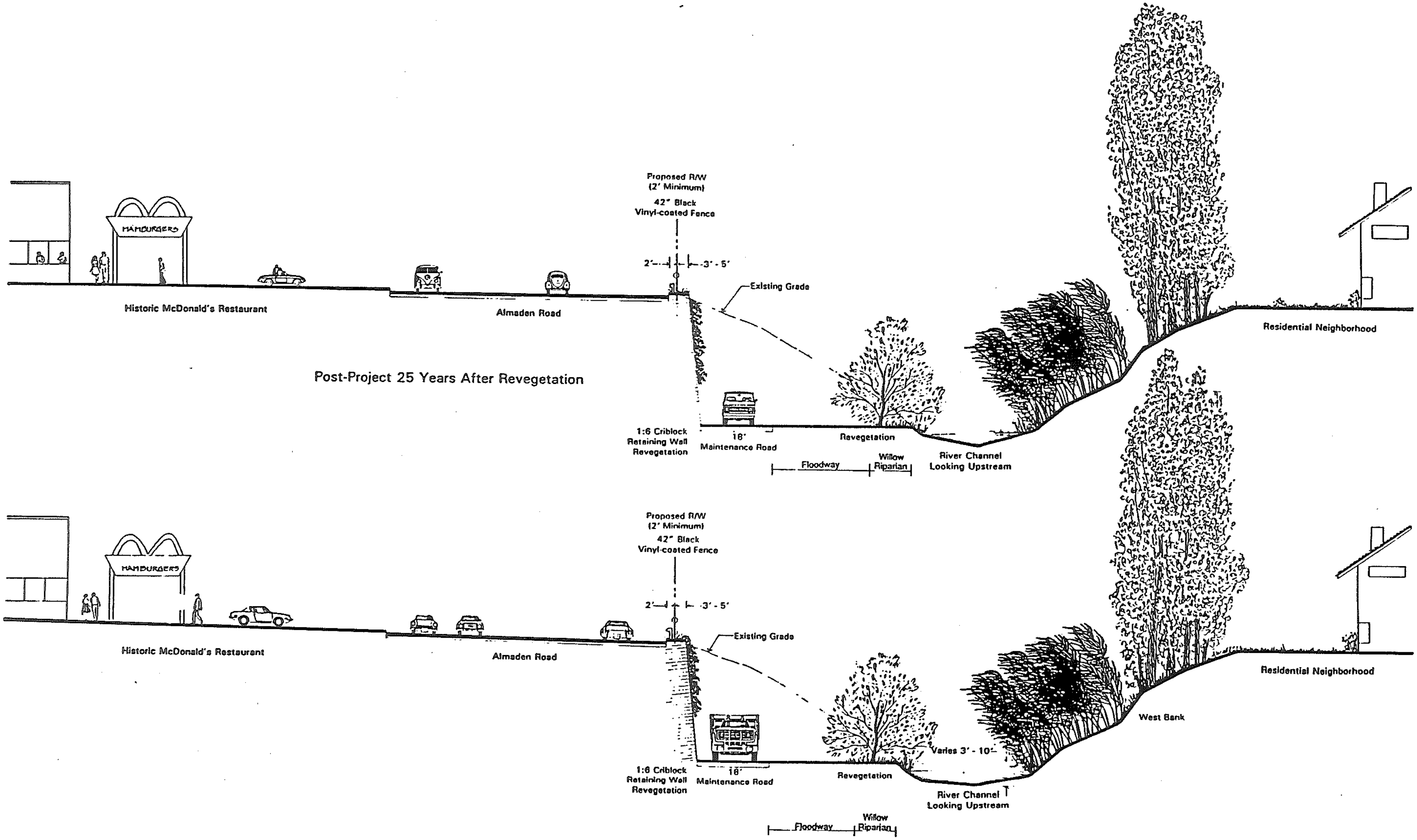

HAMBURGERS
Historic McDonald's Restaurant
Almaden Road
East Bank
Existing River Channel Looking Upstream
West Bank
Residential Neighborhood
Proposed R/W (2' Minimum)
42" Black Vinyl-coated Fence
2'
3' - 5'
Existing Grade
1:6 Criblock Retaining Wall Revegetation
18'
Maintenance Road
Revegetation
Varies 3' - 10'
River Channel Looking Upstream
Floodway
Willow Riparian

Pre-Project Existing Conditions

Post-Project 5 Years After Revegetation

Typical Section of Revegetation: 10A E - 10A E'
REACH 10A: From Station 844 + 00 to Station 851 + 00

FIGURE 3.21



Post-Project 25 Years After Revegetation

Post-Project 75 Years After Revegetation

Typical Section of Revegetation: 10A E - 10A E'
REACH 10A: From Station 844 + 00 to Station 851+ 00
East Bank Widening

FIGURE 3.21 (CONT'D)

The weir at Stream Flow Gage Station No. 23B inhibits fish migration. The weir would be lowered and modified to allow water to crest over it and create a plunge pool system for fish passage.

The future Pearl Avenue bridge would be constructed by the City in coordination with the District and the property owner. It is anticipated that the District will enter an agreement with the City and/or property owner to cost-share on the new bridge up to the amount which would have been required to replace Hillsdale Avenue bridge.

In Reach 10C, upstream of Stream Flow Gage Station No. 23B, the east bank will be excavated and a bench varying from 20 to 58 feet wide would be created 8 feet above the channel bottom. The west bank and lower east bank would remain undisturbed except at future unanticipated erosion sites. The upper east bank would be lined with stepped gabions at a 1:1 side slope. An 18-foot maintenance road would be located on the bench at the toe of the upper slope. The remainder of the bench would be revegetated. Ramps would provide access from Hillsdale Avenue to the channel. Excavation at Valley View Packing plant would begin only after the plant has ceased operations permanently.

The bridge at Hillsdale Avenue will be removed only after the completion of the Pearl Avenue bridge. The depressed 18-foot maintenance road on the east bank will continue to Capitol Expressway. The east bank would be widened to provide 1 percent flow capacity under Capitol Expressway. The west bank would remain undisturbed and barren areas revegetated. The bank above the maintenance road would be lined with cribwalls at a 1:6 slope. The bank below the maintenance road would be protected with stepped gabions.

The concrete drop structure and rubble downstream of Hillsdale Avenue which acts as a fish barrier would be removed and the channel bottom would be excavated to upstream of Capitol Expressway to create a continuously sloping bottom with rock plunge pools for fish passage. A low-flow channel would be constructed.

All man-made or eye-sore materials would be removed when there is no impacts associated with the removal and that the bank is stable.

Vortex rock weir will be installed at the meandering section of the channel, downstream of a sharp bend. The rock weir will be constructed with large boulders vary from 3 to 5 feet in diameter and will be keyed into the bank to eliminate erosion. The weir is constructed in a U-shape, with the point of the "U" facing upstream and span at the minimum the bankfull channel width. This forms a vortex that creates a downstream plunge pool for energy dissipation and aquatic habitat. Footer rocks will be installed for anchoring and prevent undermining.

Typical sections for these reaches are shown in Figures 3.22 and 3.23.

General Construction Procedures

Construction of the levee and floodwall between southbound and northbound of Almaden Expressway, and Pearl Avenue bridge would be as described for Reaches 6 and 7. Water flowing in the river during Pearl Avenue Bridge construction may be blocked and diverted around the construction area using pumps and pipes. Coffer dams will likely be needed for most construction. The California Construction BMP would be implemented.

Channel widening between northbound Almaden Expressway and Stream Flow Gage Station 23B would consist of excavation of the depressed bench and removal of gabions, and relocation of rock lining in the channel bottom to create bankfull and low-flow channels. Water flowing in the river may be blocked and diverted around the construction area using pumps and pipes.

From Stream Flow Gage Station 23B to Capitol Expressway, the channel would be excavated to the east. The depressed bench would be graded and stepped gabions and cribwalls would be installed on the channel slope. Work would be performed from the channel invert. Water flowing in the river would be blocked and diverted around the construction area using pumps and pipes.

Hillsdale Avenue Bridge would be removed only after Pearl Avenue Bridge is constructed. No major impact to traffic is anticipated. A concrete drop structure just downstream of the bridge would also be removed. Removal of the structure would most likely be performed as part of grading and excavation.

Revegetation areas in this reach would be planted with riparian plant species as designated in the mitigation plan after all construction activities are completed; typically this would be done in fall for the best survival rates.

Possible staging area for the construction equipment would be within the proposed right of way of the widened bench or revegetation areas. Access to the construction area would be at Wren Avenue, new Pearl Avenue, frontage road along the east top of bank, and Hillsdale Avenue.

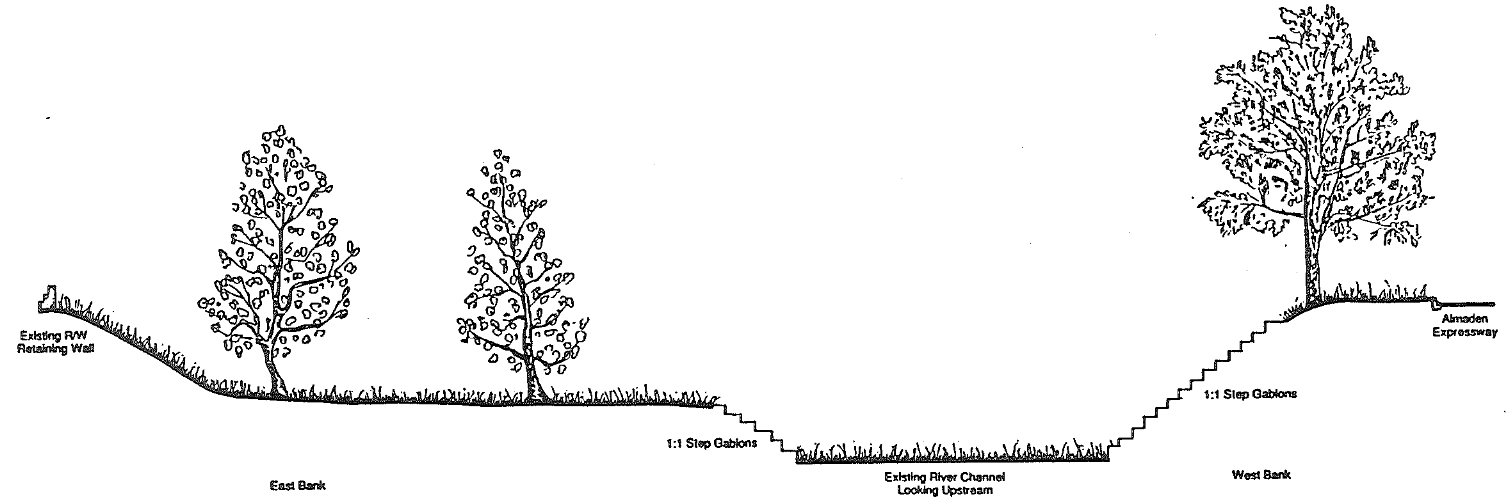
Reach 11: Capitol Expressway to Branham Lane—Widened Gabion Channel with Bench

Reach 11 extends from Capitol Expressway to Branham Lane. It is divided into three subreaches: (11A) Capitol Expressway to Bryan Avenue; (11B) Bryan Avenue to Ross Creek; and (11C) Ross Creek to Branham Lane.

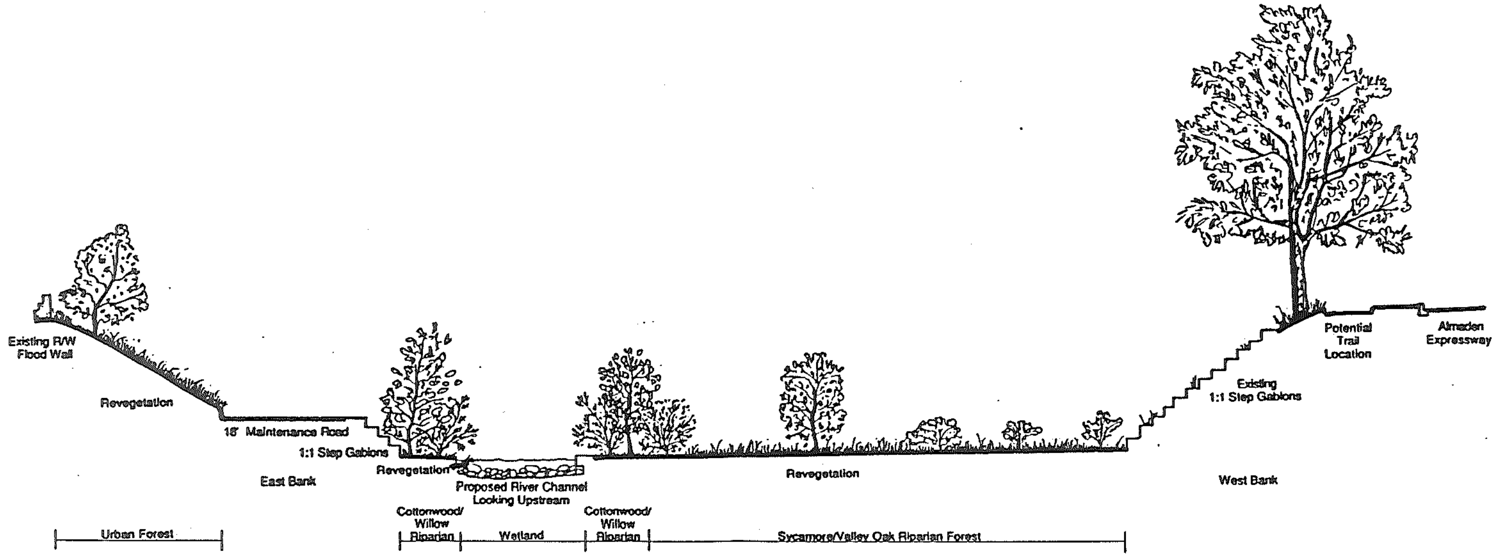
In Reach 11A, the maintenance road on the east bank from Reach 10C continues under Capitol Expressway and ramps up to the top of bank upstream of the bridge. The east bridge abutment will be excavated to provide additional flow capacity and accommodate the road. Under the bridge, the east bank will consist of a vertical concrete retaining wall above the maintenance road. The east and west banks will be protected with stepped gabions.

Upstream of Capitol Expressway to where Chard Drive meets Almaden Expressway, the west bank would remain undisturbed. The existing trees on the west bank would be preserved and barren areas would be revegetated. The east bank would be widened from Capitol Expressway to the confluence of the bypass channel, 400 feet upstream.

A 700-foot long bypass channel with 2:1 unlined side slope would be constructed to the east of the natural channel from Station 915+00 to Station 922+00. The bypass channel would be 50 feet wide at the bottom and would have a rock-lined invert. The channel bottom would be sloped 2 percent towards the west bank to create a low-flow channel. The entrance to the bypass channel would be at an elevation such that flows below 1,500 cfs would continue in the natural channel. The natural channel in this section will be undisturbed. A maintenance road would ramp down from Steval Place to the bottom of the bypass channel and continue upstream.



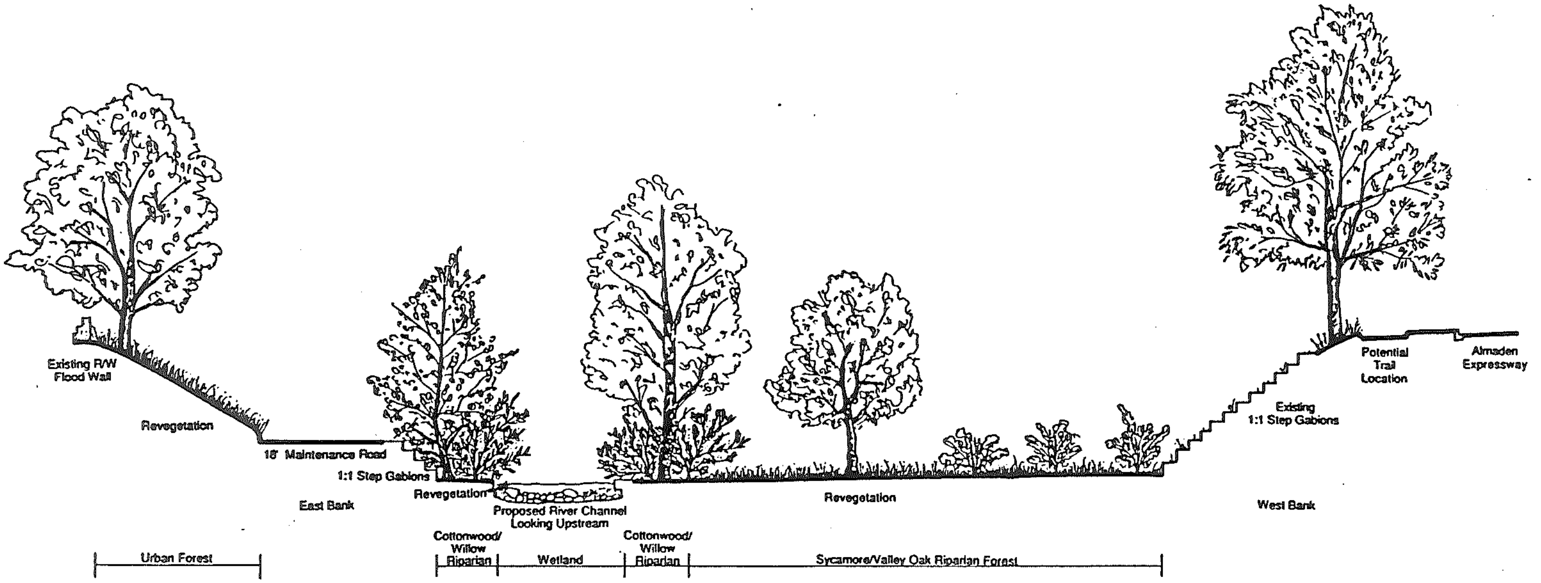
Pre-Project Existing Conditions



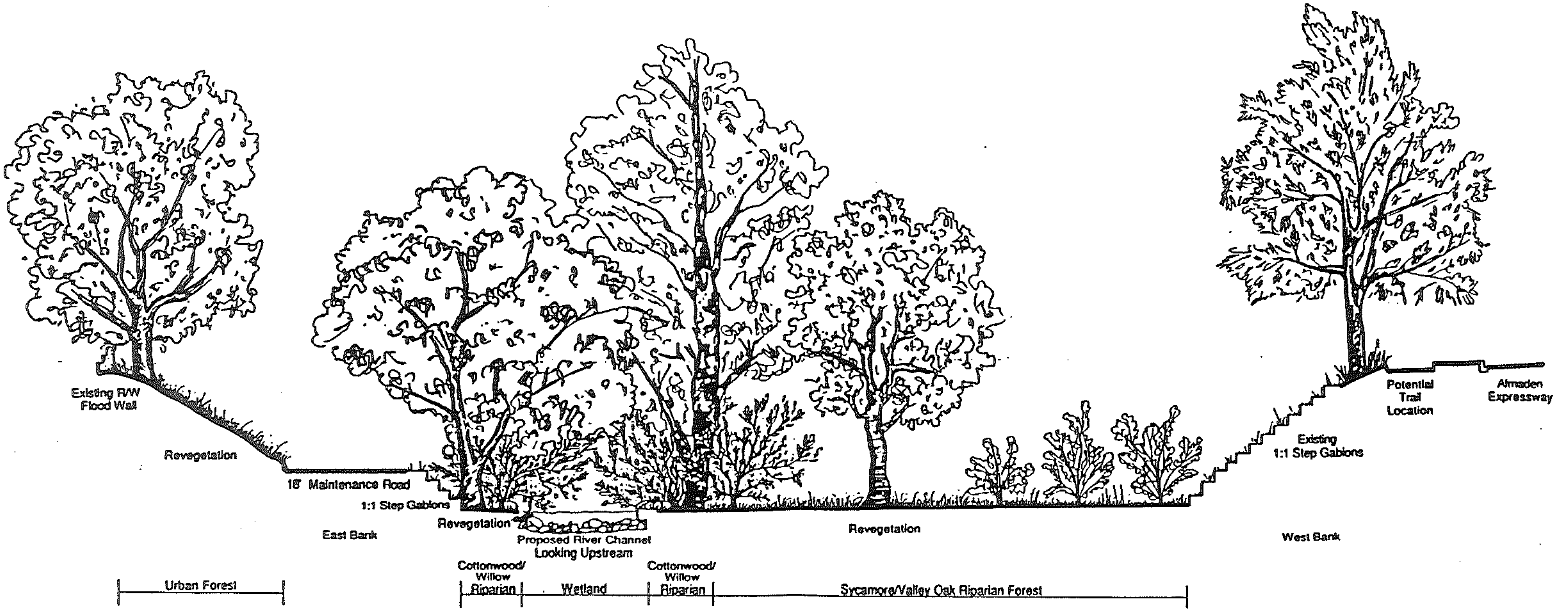
Post-Project 5 Years After Revegetation

Typical Section of Revegetation: 10B F - 10B F'
REACH 10B: From Station 876 + 00 to 877 + 00
Riparian Habitat Mitigation

FIGURE 3.22



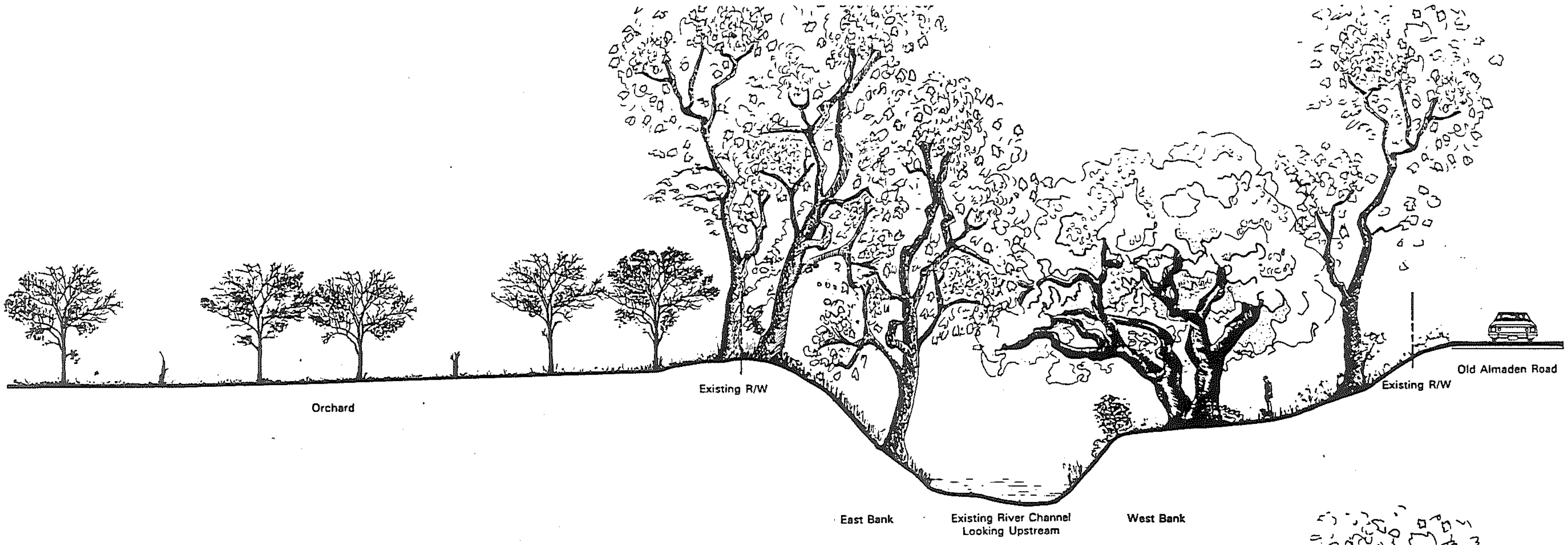
Post-Project 25 Years After Revegetation



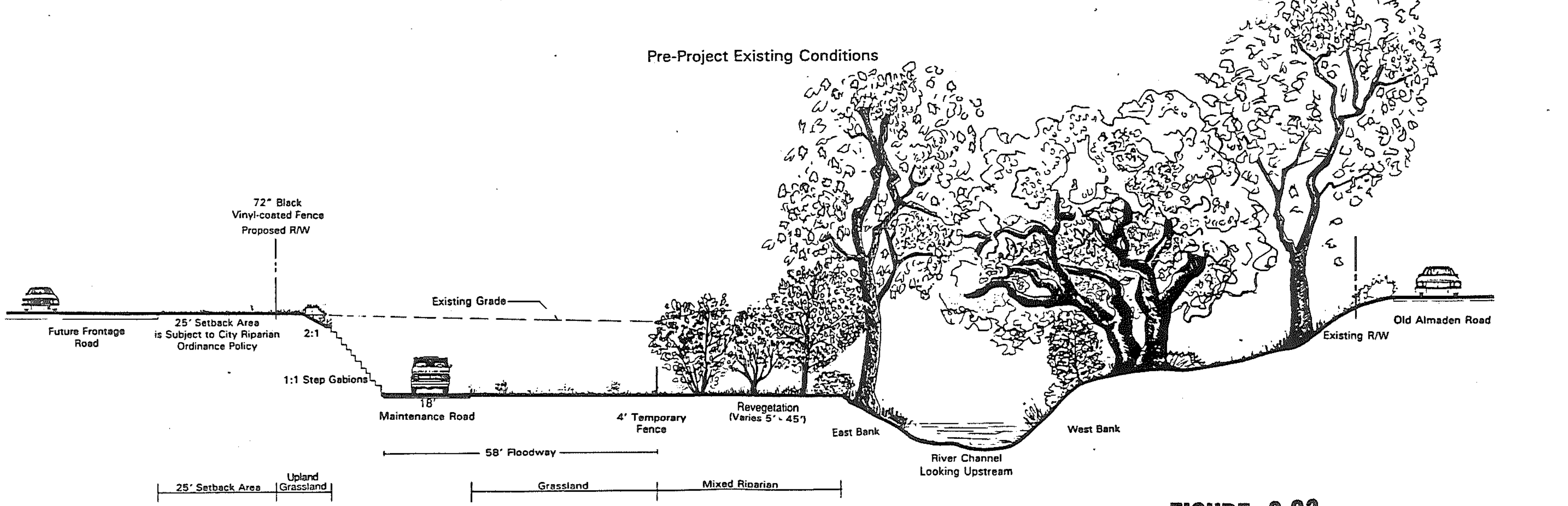
Post-Project 75 Years After Revegetation

Typical Section of Revegetation: 10B F - 10B F'
REACH 10B: From Station 876 + 00 to 877 + 00
Riparian Habitat Mitigation

FIGURE 3.22 (CONT'D)



Pre-Project Existing Conditions

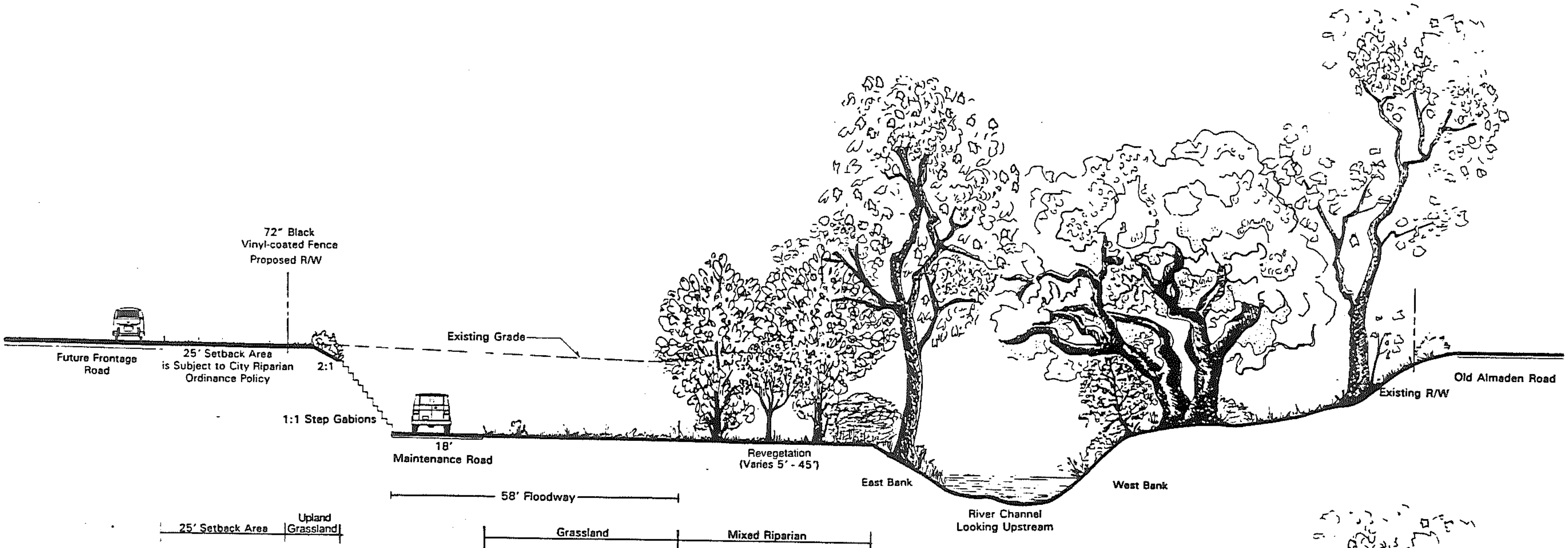


Post-Project 5 Years After Revegetation

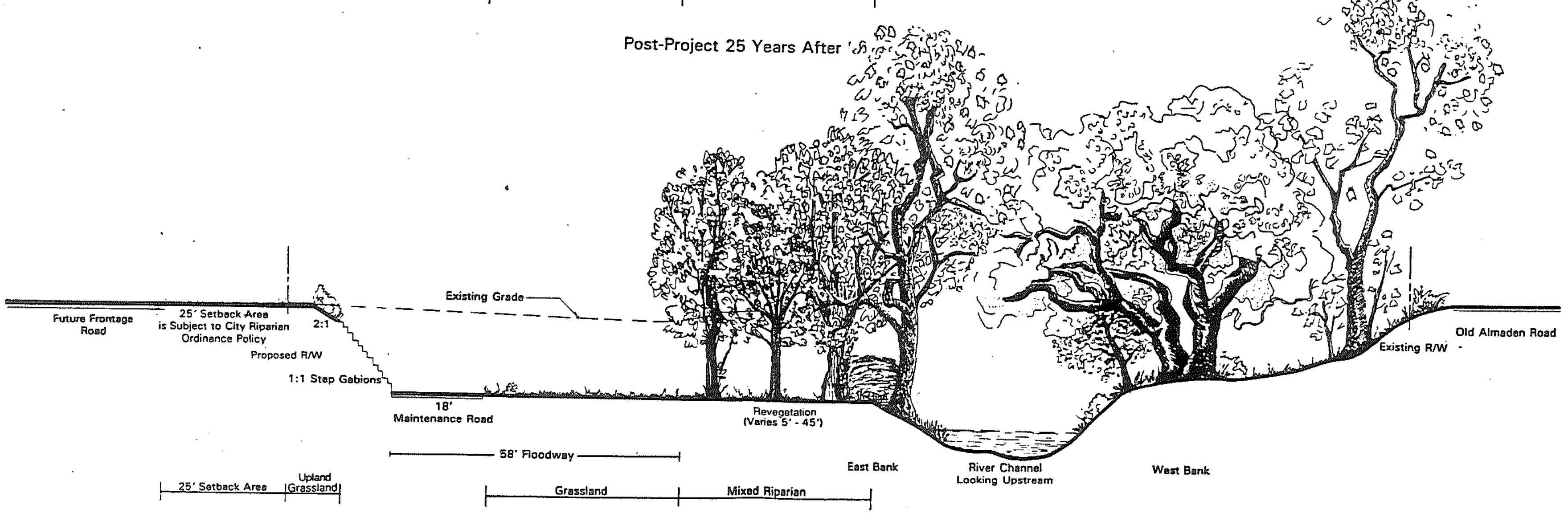
FIGURE 3.23

Typical Section of Revegetation: 10C G - 10C G'
REACH 10C: From Station 888 + 00 to Station 903+ 00
East Bank Widening

PRELIMINARY
MAY 08 1995
SUBJECT TO
REVISION



Post-Project 25 Years After '



Post-Project 75 Years After Revegetation

Typical Section of Revegetation: 10C G - 10C G'
REACH 10C: From Station 888 + 00 to Station 903+ 00
East Bank Widening

FIGURE 3.23 (CONT'D)

PRELIMINARY
MAY 0 8 1995
SUBJECT TO REVISION

East bank widening would begin upstream of the bypass channel, about 1,500 feet upstream of Capitol Expressway to Bryan Avenue. An 18-foot wide depressed maintenance road would continue on the east bank. The bank below the road would be earth at 2:1 slope and the upper bank would be protected with stepped gabions on a 1:1 slope up to the 1 percent water surface elevation. Above the 1 percent flow elevation, the upper east bank would be earth on a slope of 2:1 for revegetation. The distance from the top of the east bank to the right of way would be 5 feet. Planting areas would be provided in the stepped gabions.

The 18-foot maintenance road on the top of bank upstream of Capitol Expressway would end at Steval Place. The depressed maintenance road on the east bank upstream of the bypass channel would continue upstream to the SJWC property. Maintenance access would also be provided on the top of east bank and would be designed to avoid existing trees. Gates would limit access to these areas. Bare areas would be planted with riparian vegetation. Existing concrete rubble, acting as fish barrier, in the channel bottom would be removed.

In Reach 11B, the west bank would be widened with 1:6 side slope, lined with cribwalls, to create a depressed bench up to 40 feet wide, 5 feet above the channel bottom. The depressed bench on the west bank would be revegetated. An 18-foot maintenance road and ramps would be provided to service the revegetation area and for access to the channel bottom. An abandoned SJWC concrete low-flow crossing that acts as a fish barrier would be removed. An existing SJWC well and associated piping on the west side of the river would be relocated.

A maintenance road would also be provided on the east top of bank. An easement would be required from the SJWC for the maintenance road. The maintenance road would be designed to avoid the existing vegetation including clumps of sycamore trees.

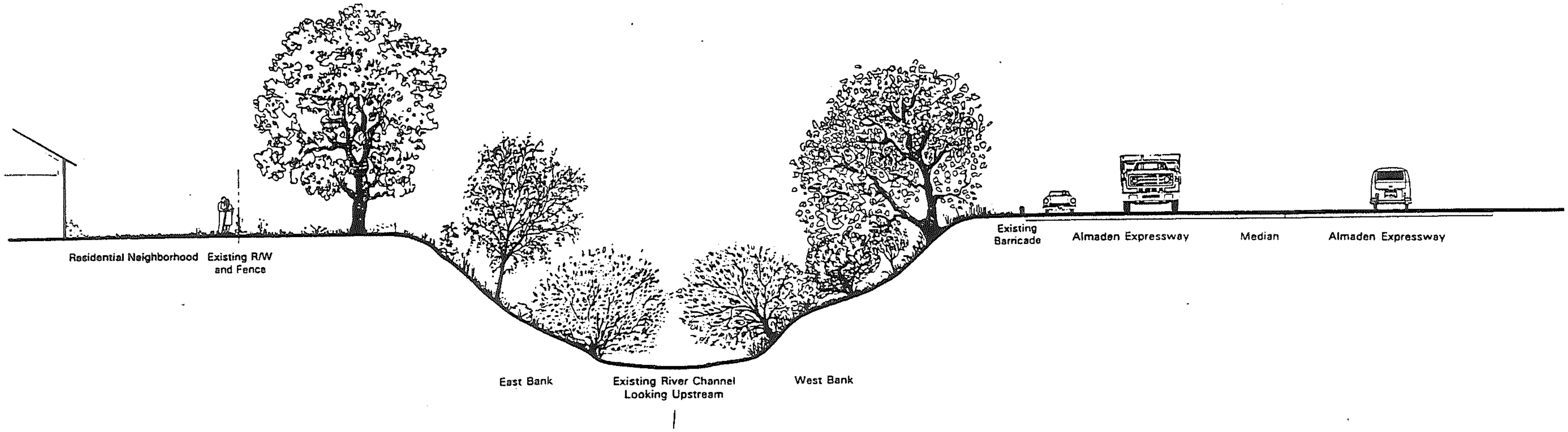
In Reach 11C, the west bank would be widened with a 1:6 side slope lined with cribwalls. A depressed bench would be created for a floodway and revegetation sites and would be designed to minimize impacts to existing trees. A ramp down to the depressed bench would be provided. The widening would require the removal of portions of a parking area for one commercial building. The parking area would be relocated to the south of the building. The east bank would be undisturbed. The continuous maintenance road from downstream would be located on the east bank. A ramp would be provided for the underpass at Branham Lane.

All man-made or eye-sore materials would be removed when there is no impacts associated with the removal and that the bank is stable.

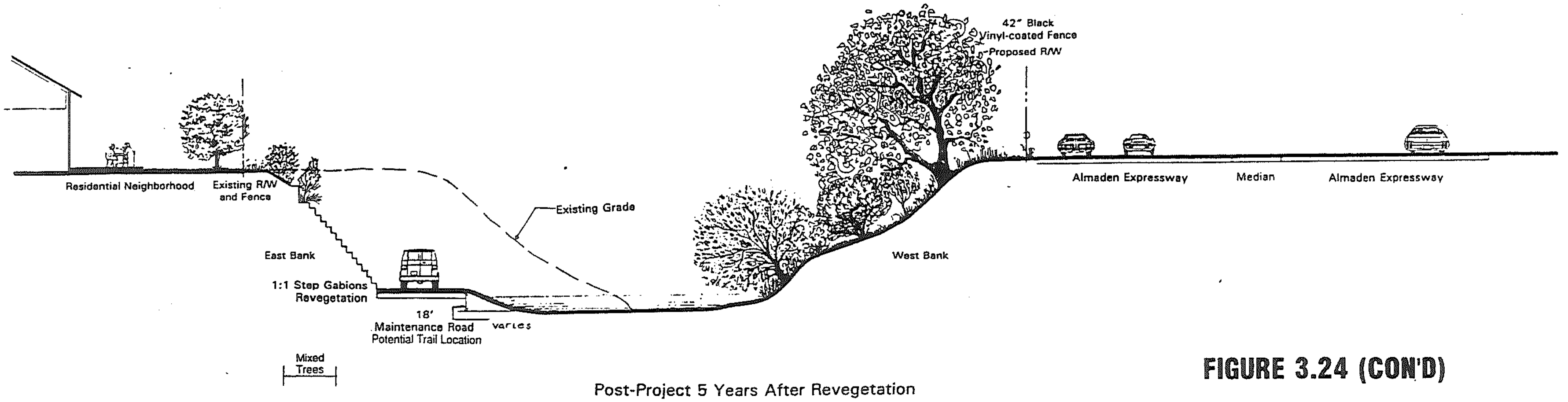
The Ross Creek confluence would be improved by adding a 20- by 10-foot RCB to the existing culvert and designed to direct the flow from Ross Creek downstream. A concrete apron would be constructed at the outlet of the culvert. A fish pool system would be constructed for fish migration upstream of Ross Creek. For more information, see Ross Creek Project on page 3-127.

Vortex rock weir will be installed at the meandering section of the channel, downstream of a sharp bend. The rock weir will be constructed with large boulders varying from 3 to 5 feet in diameter and will be keyed into the bank to eliminate erosion. The weir is constructed in a U-shape, with the point of the "U" facing upstream and span at the minimum the bankfull channel width. This forms a vortex that creates a downstream plunge pool for energy dissipation and aquatic habitat. Footer rocks will be installed for anchoring and prevent undermining.

Typical sections for these reaches are shown in Figures 3.24, 3.25, and 3.26.



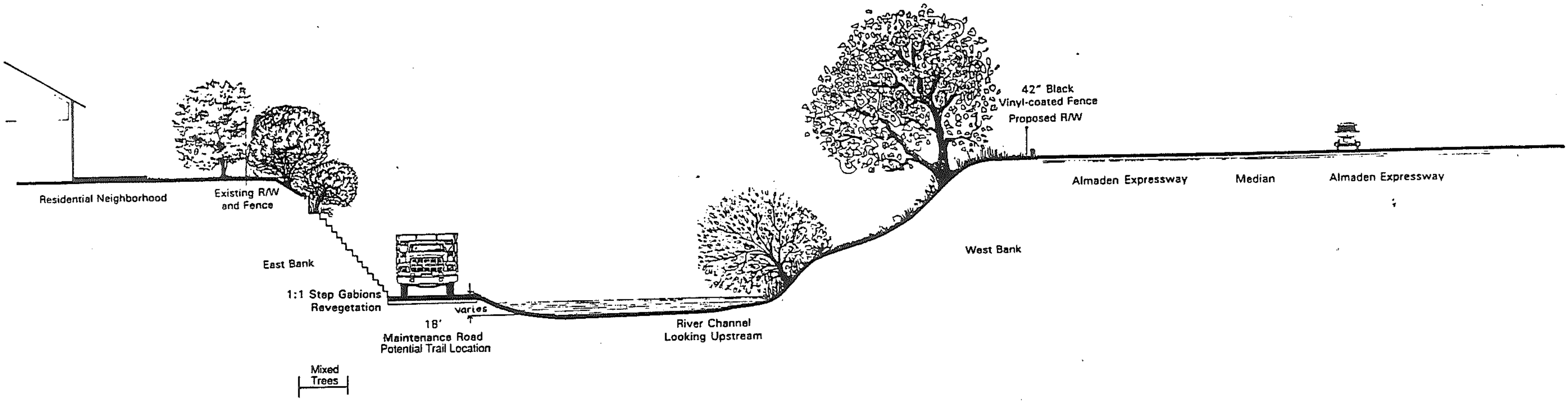
Pre-Project Existing Conditions



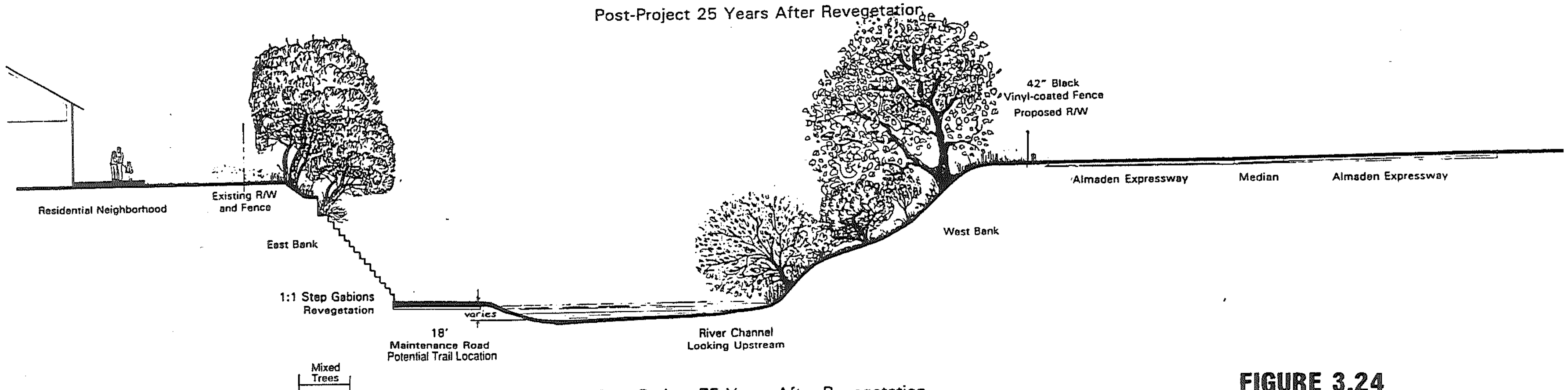
Post-Project 5 Years After Revegetation

FIGURE 3.24 (CON'D)

Typical Section of Revegetation: 11A H - 11A H'
REACH 11A: From Station 925 + 00 to Station 937+ 00
East Bank Widening


Residential Neighborhood
Existing R/W and Fence
East Bank
1:1 Step Gabions Revegetation
18'
Maintenance Road Potential Trail Location
varies
Mixed Trees
River Channel Looking Upstream
West Bank
42" Black Vinyl-coated Fence Proposed R/W
Almaden Expressway
Median
Almaden Expressway

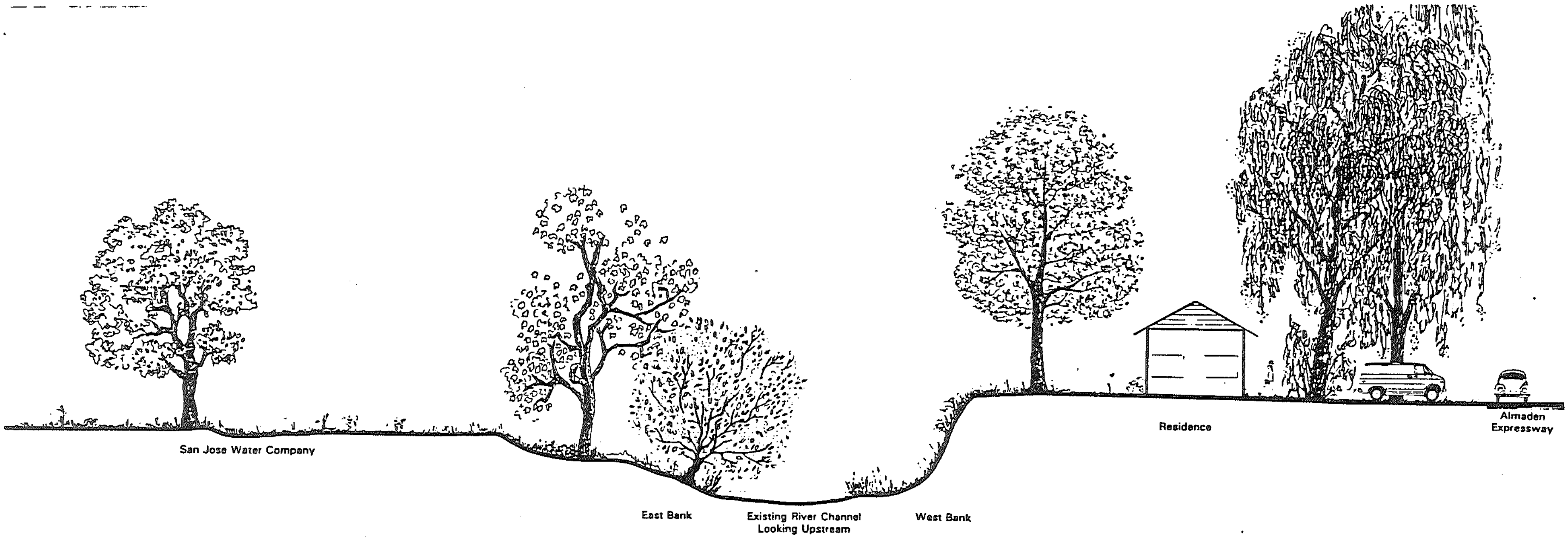
Post-Project 25 Years After Revegetation


Residential Neighborhood
Existing R/W and Fence
East Bank
1:1 Step Gabions Revegetation
18'
Maintenance Road Potential Trail Location
varies
Mixed Trees
River Channel Looking Upstream
West Bank
42" Black Vinyl-coated Fence Proposed R/W
Almaden Expressway
Median
Almaden Expressway

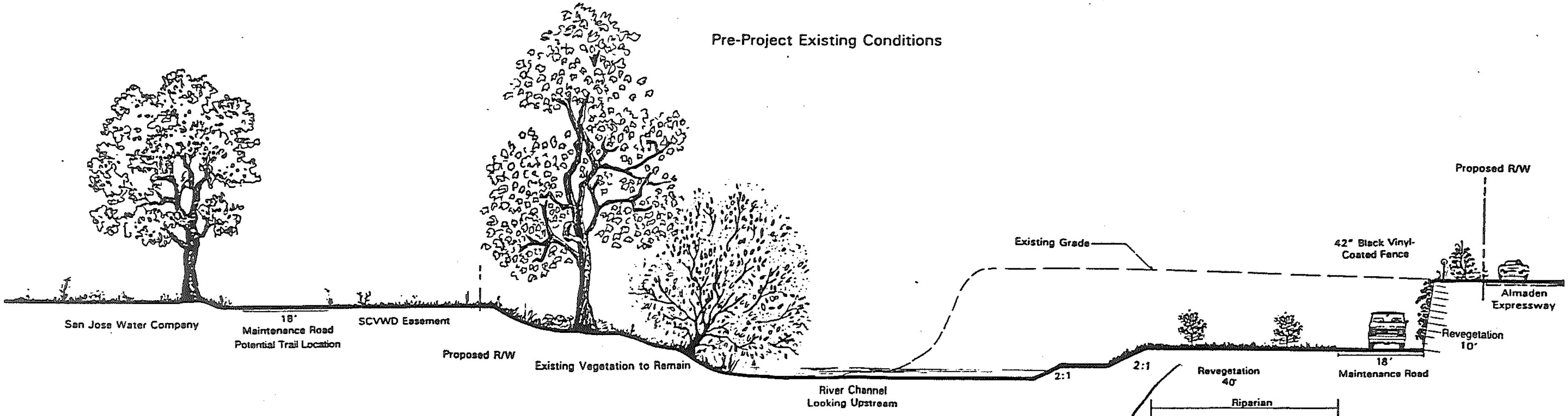
Post-Project 75 Years After Revegetation

FIGURE 3.24

Typical Section of Revegetation: 11A H - 11A H'
REACH 11A: From Station 925 + 00 to Station 937+ 00
East Bank Widening



Pre-Project Existing Conditions



Post-Project 5 Years After Revegetation

Typical Section of Revegetation: 11B J - 11B J'

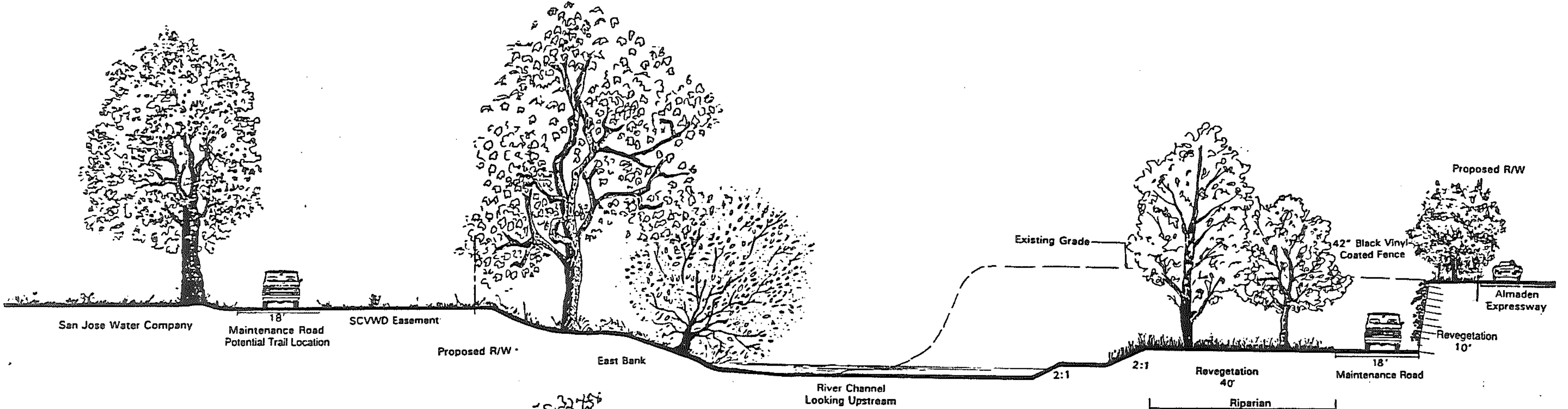
REACH 11B: From Station 943 + 00 to Station 947+ 00
West Bank Widening

BIG TREES

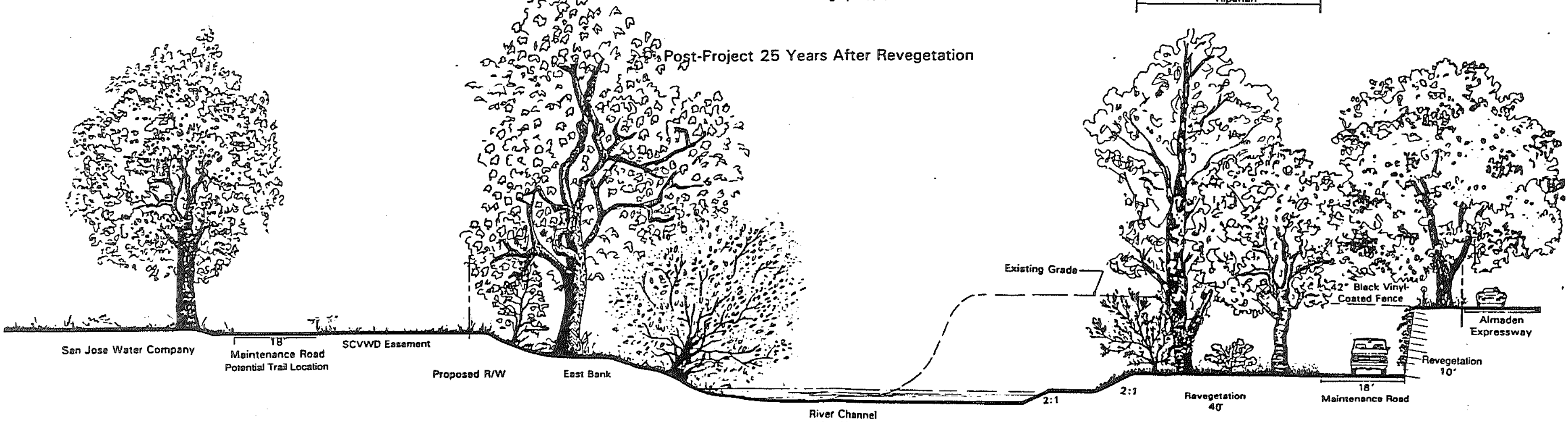
FIGURE 3.25

PRELIMINARY
MAY 08 1995
SUBJECT TO REVISION

10'



Post-Project 25 Years After Revegetation



Post-Project 75 Years After Revegetation

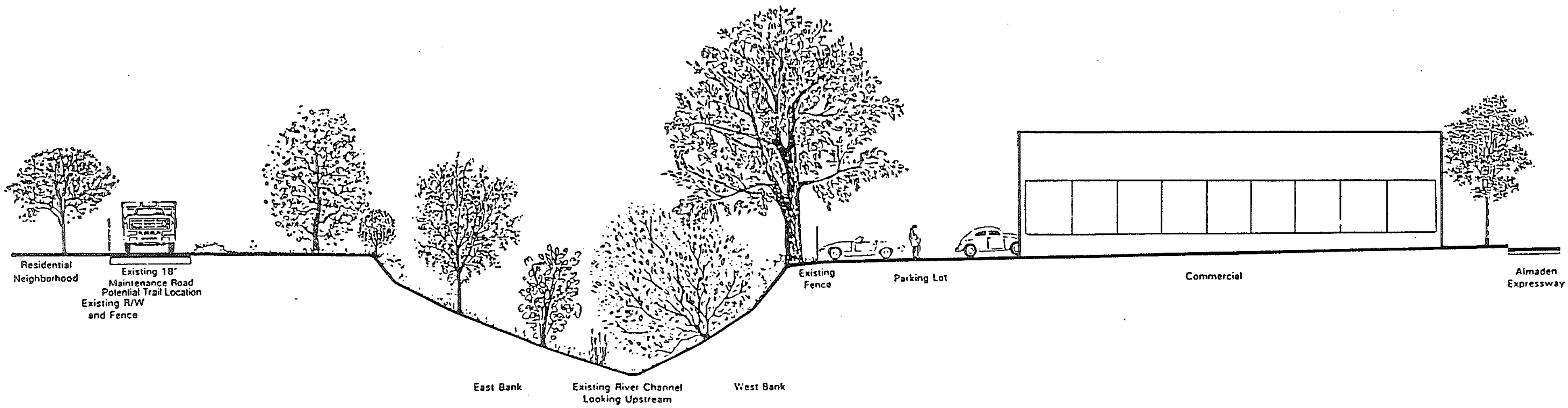
Typical Section of Revegetation: 11B J - 11B J'

REACH 11B: From Station 943 + 00 to Station 947+ 00
West Bank Widening

FIGURE 3.25 (CONT'D)

MAY 08 1995

SUBJECT TO
REVISION



Pre-Project Existing Conditions

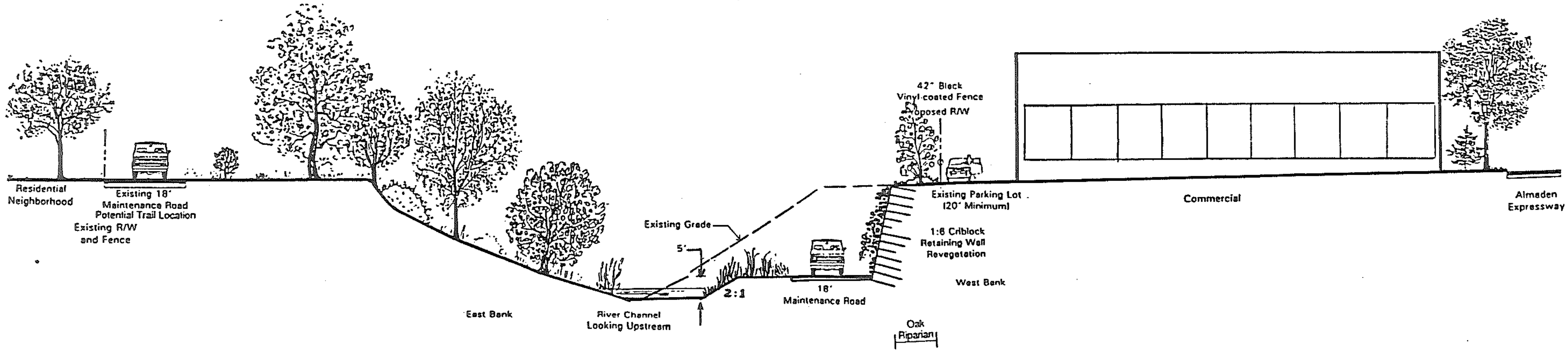
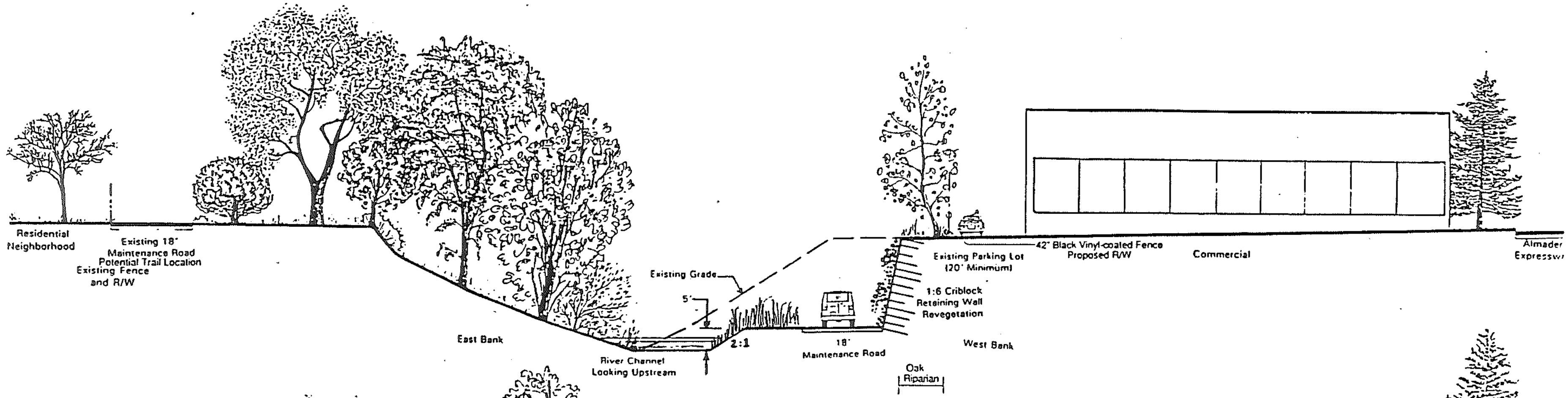

Residential Neighborhood
Existing 18' Maintenance Road Potential Trail Location
Existing R/W and Fence
East Bank
River Channel Looking Upstream
Existing Grade
5'
2:1
18' Maintenance Road
42" Black Vinyl-coated Fence Proposed R/W
Existing Parking Lot (20' Minimum)
1:6 Criblock Retaining Wall Revegetation
West Bank
Oak
Riparian
Commercial
Almaden Expressway
5'
10'

FIGURE 3.26

Post-Project 5 Years After Revegetation

Typical Section of Revegetation: 11C K - 11C K'

REACH 11C: From Station 952 + 50 to Station 955+ 50


Residential Neighborhood
Existing 18' Maintenance Road Potential Trail Location
Existing Fence and R/W
East Bank
River Channel Looking Upstream
Existing Grade
5'
2:1
18' Maintenance Road
Oak Riparian
1:6 Criblock Retaining Wall Revegetation
West Bank
Existing Parking Lot (20' Minimum)
42" Black Vinyl-coated Fence Proposed R/W
Commercial
Almaden Expressway

Post-Project 25 Years After Revegetation

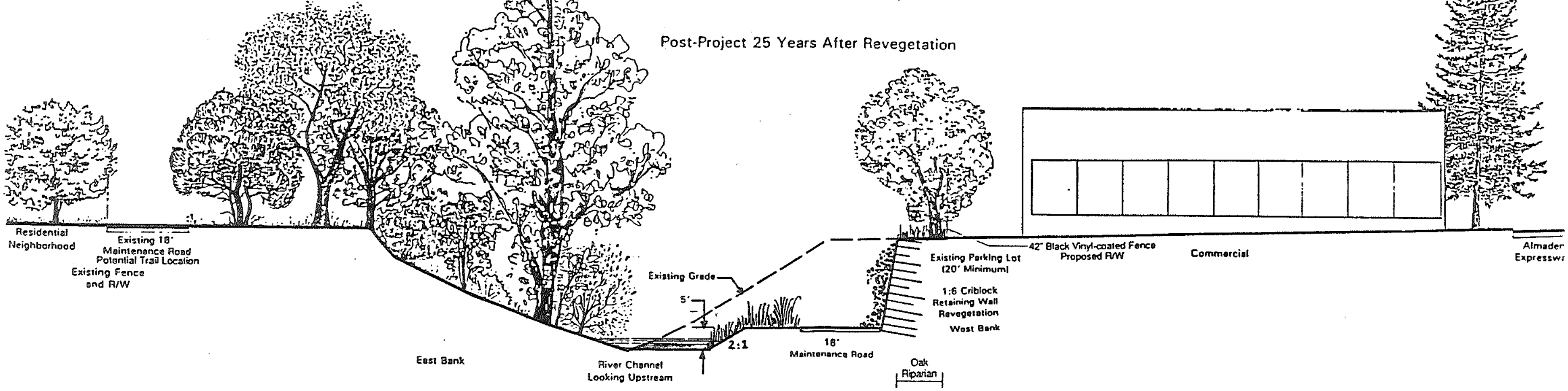

Residential Neighborhood
Existing 18' Maintenance Road Potential Trail Location
Existing Fence and R/W
East Bank
River Channel Looking Upstream
Existing Grade
5'
2:1
18' Maintenance Road
Oak Riparian
1:6 Criblock Retaining Wall Revegetation
West Bank
Existing Parking Lot (20' Minimum)
42" Black Vinyl-coated Fence Proposed R/W
Commercial
Almaden Expressway

FIGURE 3.26 (CONT'D)

Post-Project 75 Years After Revegetation
Typical Section of Revegetation: 11C K - 11C K'
REACH 11C: From Station 952 + 50 to Station 955+ 50
West Bank Widening

General Construction Procedures

Construction of the bypass channel would be as described for Reach 6.

The east bank widening along Almaden Expressway would consist of excavation, stepped gabions installation, and backfill behind the gabions. Fish barriers and concrete rubble in the channel bottom would be removed. Typically, most of the construction would be performed from the channel invert. Water flowing in the river may be blocked and diverted around the construction area using pumps and pipes. Coffer dams will likely be needed for most construction. The California Construction BMP would be implemented.

Prior to the west bank excavation, a shoring system would be installed. The shoring system could consist of sheet piles or soldier piles with lagging. Traffic control on Almaden Expressway would be provided during installation of the shoring system.

Prior to excavation at the SJWC property, one well and associated facilities in the construction area would be relocated. Location of the new well would be coordinated with SJWC in advance of channel construction.

Revegetation areas in this reach would be planted with riparian plant species as designated in the mitigation plan after all construction activities are completed; typically this would be done in fall for the best survival rates.

Possible staging area for the construction equipment would be at east top of bank adjacent to Almaden Expressway and top of bank just upstream of Ross Creek confluence. Access to the construction area would be at the existing easement on the Larson property, the channel bottom, and SJWC property.

Reach 12: Branham Lane to Blossom Hill Road—Levee and Revegetation Area

Reach 12 extends from Branham Lane to the upstream end of the project at Blossom Hill Road. From Branham Lane to the existing offstream percolation ponds, the channel is adequate to contain the 1 percent flow. For mitigation to the impacts of the project, approximately 9 acres of land on the west bank would be acquired for revegetation. In order to create wetland and open water habitat, the adjacent land would be excavated up to 20 feet deep. The 4.5 acres of wetland mitigation pond created would also be functioning as a recharge pond to mitigate for the impact on the off-stream percolation ponds in this reach. Maintenance roads would be located on the top of both the east and west banks. A ramp is proposed to provide access under the Branham Lane bridge.

The City plans to construct future Chynoweth Avenue which will impact approximately 1.4 acres of the existing percolation pond. The City would place fill over the existing percolation ponds to accommodate a longer approach to the new bridge and minimize the bridge span length across the river. The mitigation for lost recharge due to the City's impacts would be included in the proposed mitigation pond in this reach. The City would enter an agreement with the District to purchase land and perform work for which the City would later reimburse the District.

From the downstream end of the offstream percolation ponds to Blossom Hill Road, the channel would be widened primarily to the west and existing levees on both banks would be reconstructed and raised. The west bank levee would be moved 25 feet to the west to create a revegetation bench. The estimated impact acreages on the existing percolation ponds are 3.0 acres. Maintenance roads will be located on both tops of banks and on the bench.

All man-made or eye-sore materials would be removed when there is no impacts associated with the removal and that the bank is stable.

In this reach, there are two seasonal gravel dams constructed for in-stream percolation. One is located at 1,000 feet upstream of Branham Lane and the other at 1,800 feet downstream of Blossom Hill Road. The dams operate at 164 feet and 171 feet NGVD water surface elevations, respectively. Alternative to replace the two gravel dams with permanent inflatable dams that would remain inflated year round except during high flood flows was analyzed. Fish step pool systems were designed so that the dam operations would not affect fish migration. For specific details on the alternative analysis, see page 3-82. The construction of the two premanent inflatable dams are not proposed at this time because the water rights issues and the process to appropriate and use the water are yet to be investigated.

Typical sections for this reach are shown in Figure 3.27.

General Construction Procedures

Prior to excavation of wetland mitigation ponds in the designated area, the first 2 feet of top soil would be removed and stockpiled on site.

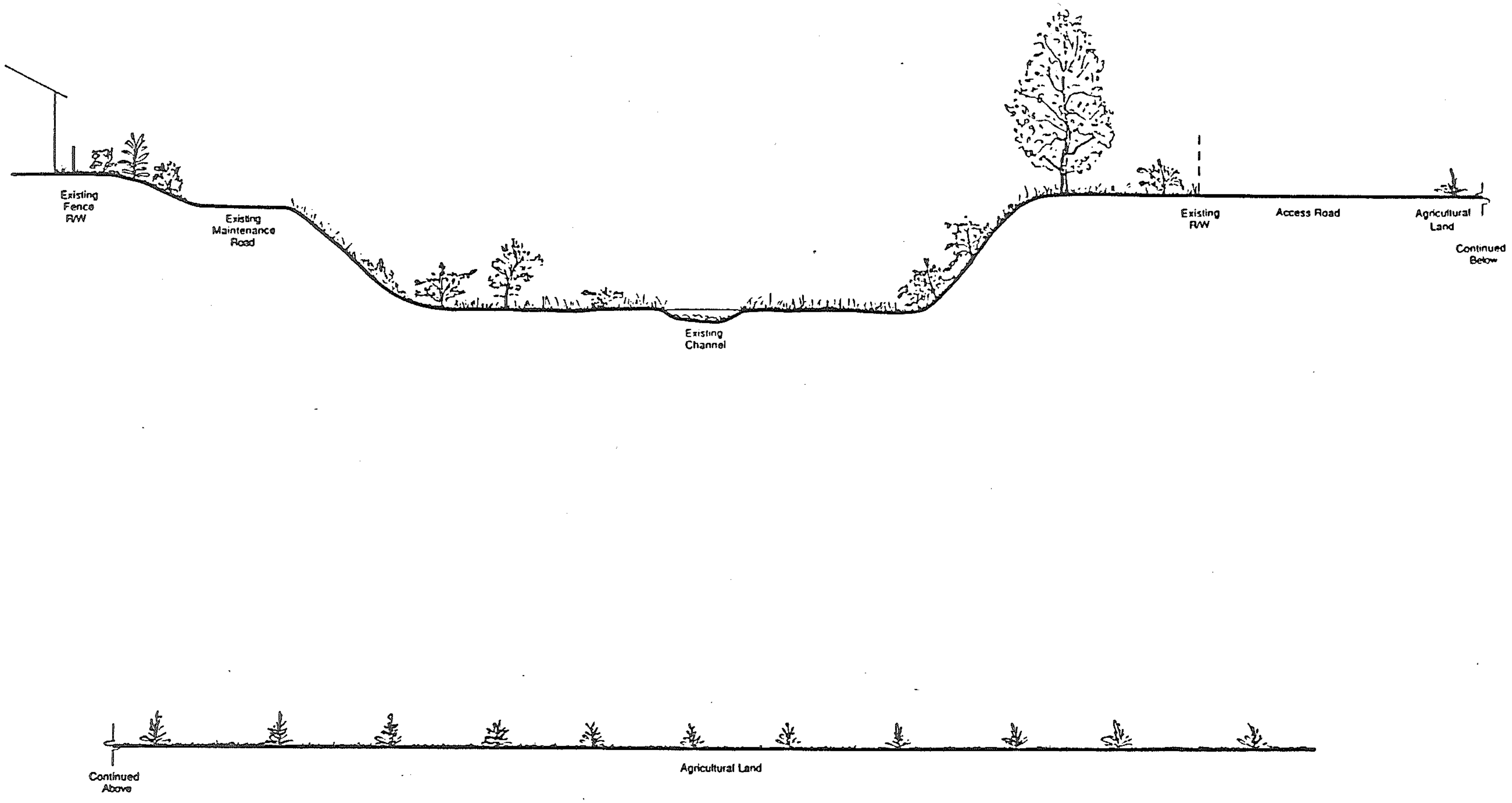
After the mitigation ponds are excavated, the banks would be graded to a slope 2:1. Stockpiled topsoil would then be reapplied to areas where revegetation is to occur.

Construction of the levees from Chynoweth Avenue to Blossom Hill Road would consist of excavation of the existing levees, replacing and compacting the soil excavated to the standard compaction test, and construction of maintenance roads on top of levees. Additional soil from the mitigation ponds excavation could potentially be used to reconstruct the levees.

Typically most of the construction will be performed from the channel invert. Water flowing in the river may be blocked and diverted around the construction area using pumps and pipes. Coffer dams will likely be needed for most construction. The California Construction BMP would be implemented.

Revegetation areas in this reach would be planted with riparian plant species as designated in the mitigation plan after all construction activities are completed; typically this would be done in fall for the best survival rates.

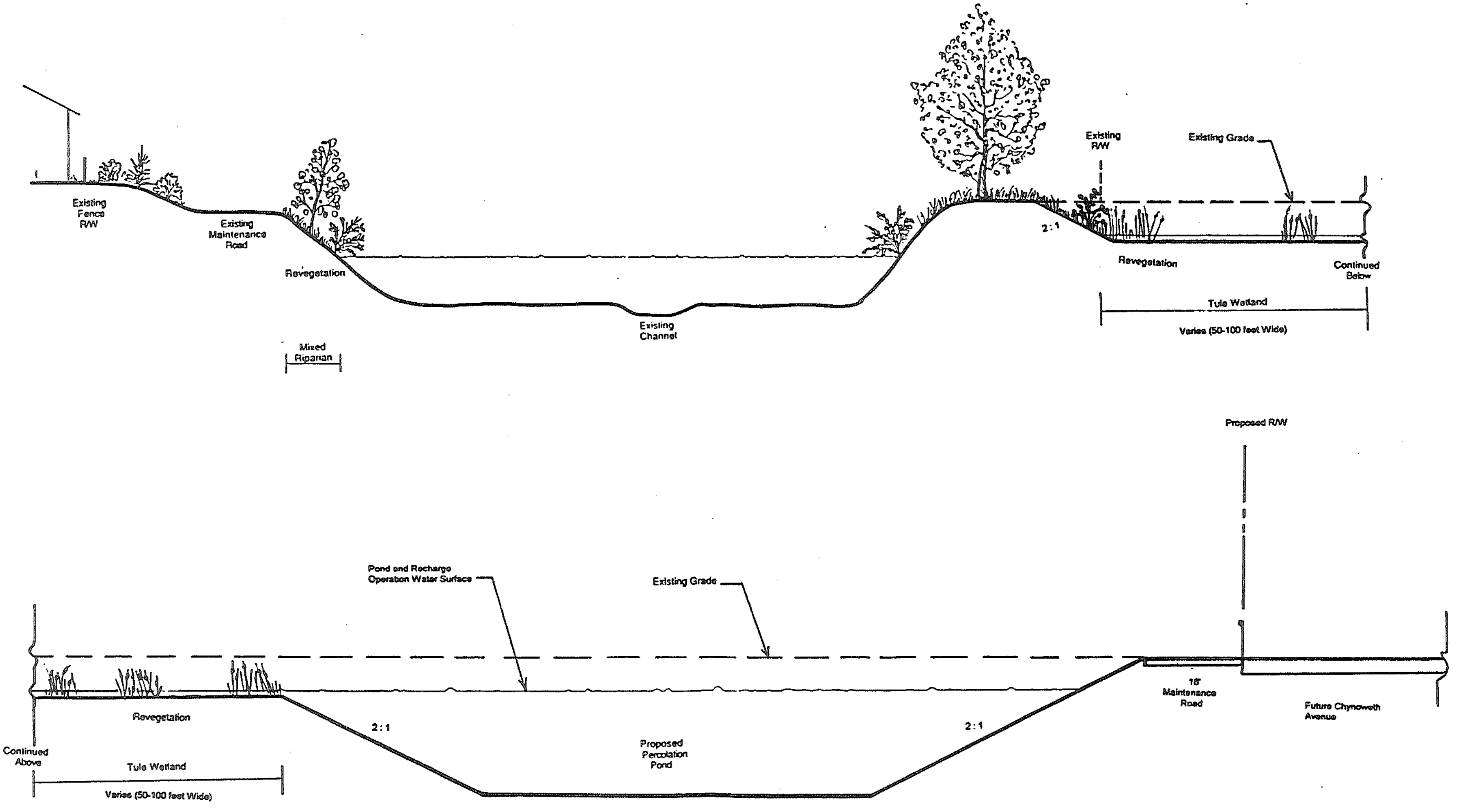
Possible staging area for the construction equipment would be within the proposed right of way of the mitigation area. Access to the construction area would be at Branham Lane, Chynoweth Avenue, and Blossom Hill Road.



Pre-Project Existing Conditions

Typical Section of Revegetation: 12 L - 12 L'
REACH 12: From Station 975+00 - 985+00
Riparian Habitat Mitigation

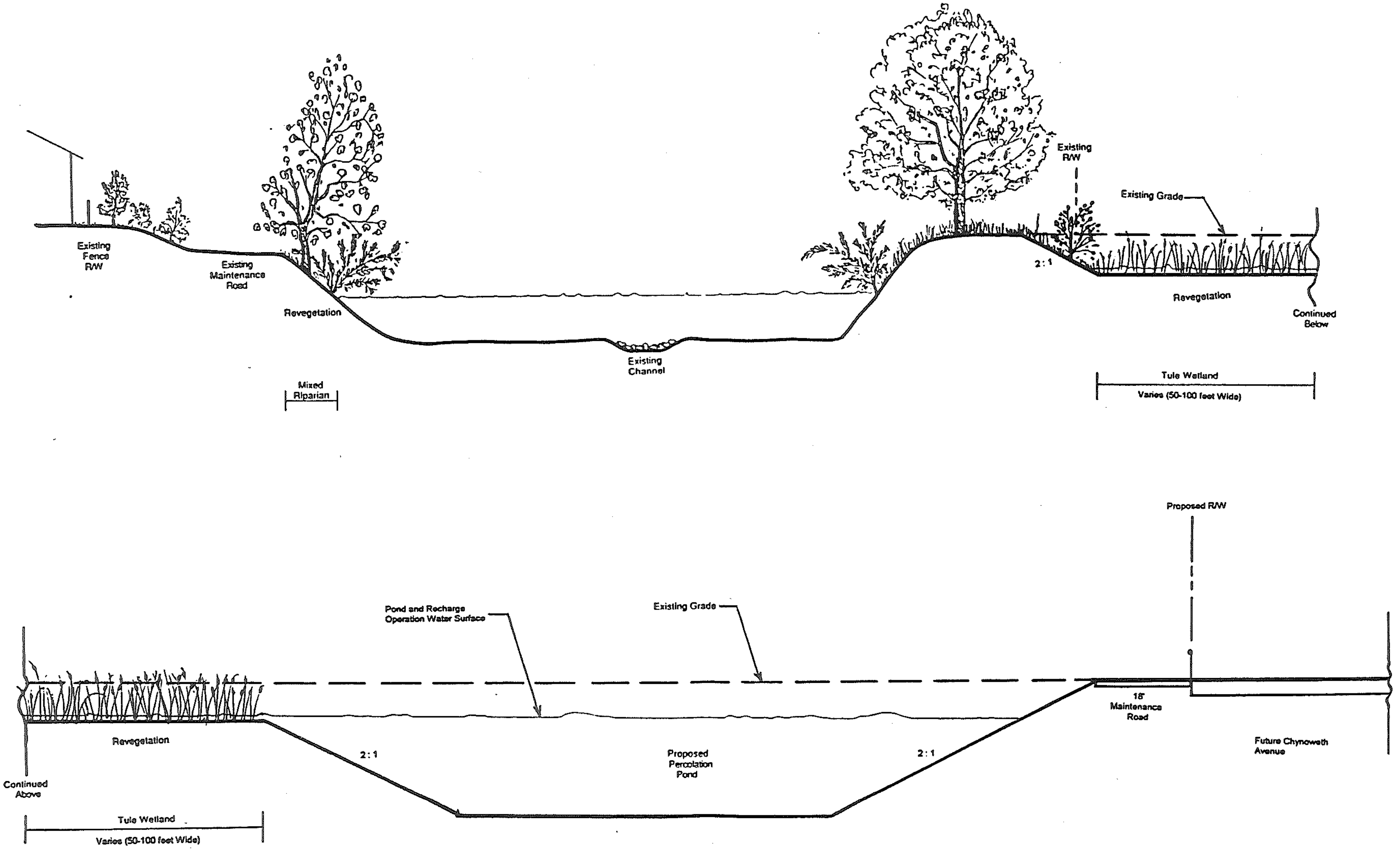
FIGURE 3.27



Post-Project 5 Years After Revegetation

Typical Section of Revegetation: 12 L - 12 L'
REACH 12: From Station 975+00 - 985+00
Riparian Habitat Mitigation

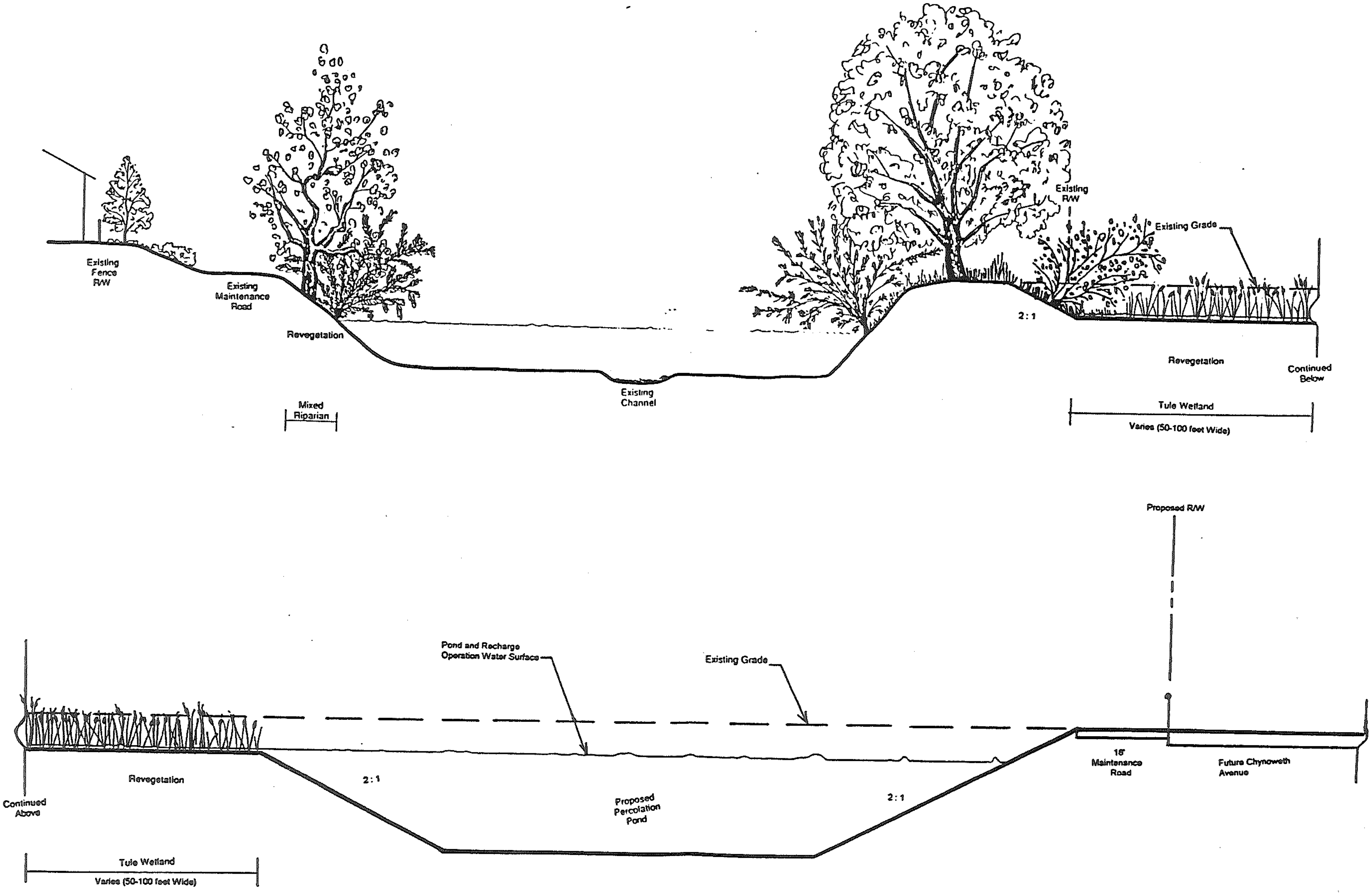
FIGURE 3.27 (CONT'D)



Post-Project 25 Years After Revegetation

Typical Section of Revegetation: 12 L - 12 L'
REACH 12: From Station 975+00 - 985+00
Riparian Habitat Mitigation

FIGURE 3.27 (CONT'D)



Post-Project 75 Years After Revegetation

Typical Section of Revegetation: 12 L - 12 L'
REACH 12: From Station 975+00 - 985+00
Riparian Habitat Mitigation

FIGURE 3.27 (CONT'D)

Canoas Creek: Almaden Expressway to End of Nightingale Drive—Floodwalls

From northbound Almaden Expressway to Nightingale Drive culvert, floodwalls would be constructed on both banks. Upstream of the culvert to end of Nightingale Drive, floodwall would be constructed only on the west bank and conform to future upstream floodwall levee. The floodwalls would be 3 to 4 feet high and located 2 feet inside the District rights of way. The 18-foot maintenance road would remain inside the floodwalls and ramps would be provided for access onto Almaden Expressway and Nightingale Drive. Existing stream flow gage station would be replaced in coordination with technical support staff if necessary.

A 20- by 12-foot concrete cell would be added adjacent to the existing double 10- by 12-foot RCB culverts at Almaden Expressway. This addition would be on the north side of the existing box culverts and the existing outlet transition would be improved to accommodate the new cell.

Similarly, a 9- by 9½-foot concrete cell would be added to the existing double 9- by 9½-foot existing RCB culverts at Nightingale Drive. This addition would be on the south side of the existing box culverts and both the inlet and outlet transitions would be modified to accommodate the new cell.

General Construction Procedures

Construction of the box culvert under Almaden Expressway would be staged so as to maintain three lanes open for traffic. Typically, this could be accomplished by relocating the existing three northbound lanes to the space currently occupied by a right-turn lane and a frontage road. This would necessitate temporary closure of the right-turn lane and the frontage road, during the time when the west half of the new culvert would be constructed. Then the expressway would be moved back to allow construction of the remainder of the culvert, after which the turn lane and frontage road could reopen.

Prior to construction of the box culvert under Almaden Expressway, a shoring system would be installed. The shoring system could consist of sheet piles or soldier piles with lagging.

After the installation of the shoring system, the channel would be excavated. The box culvert bottom would be poured, followed by form work installation and pouring of the culvert walls and soffit. After completion of the culvert and removal of form work, backfill would be placed behind the culvert walls, and roadway paved.

Construction of the box culvert under Nightingale Drive would be similar to Almaden Expressway, except Nightingale Drive would be temporarily closed and traffic would be detoured. Southbound traffic could use the frontage road along Northbound Almaden Expressway while northbound traffic could use Redbird Drive and the frontage road.

The construction of culverts under Almaden Expressway and Nightingale Drive would be scheduled at separate times.

Water flowing in the creek during the culverts construction may be blocked and diverted around the construction area using pumps and pipes. Coffer dams will likely be needed for most construction. The California Construction BMP would be implemented.

Floodwalls construction along the north and south top of banks would consist of trench excavation, form work installation, concrete pouring, backfill, and aesthetic texturing on the face of the walls. Structures which are damaged as a result of construction would be repaired or replaced.

Possible staging area for the construction equipment would be at Reach 10 construction areas. Access to the construction area would be at Almaden Expressway and Nightingale Drive.

Ross Creek: Almaden Expressway to 700 Feet Upstream of Jarvis Avenue—Widened Channel with ACM Lining

From Almaden Expressway to Jarvis Avenue, the channel is inadequate to convey 1 percent design flow. The channel bottom would be widened to 30 feet with 1:1 side slopes. Both banks would be lined with ACM. An 18-foot maintenance road would be established on the south top of bank. The maintenance would be depressed 3 feet below grade for security to adjacent properties. Existing stream flow gage station would be replaced in coordination with technical support staff if necessary.

A second 20- by 10-foot RCB culvert would be added on the north side of the existing culvert under Almaden Expressway to increase the capacity to convey the 1 percent design flow. The existing sewer line in Almaden Expressway would be relocated in coordination with the City. Similarly, at Jarvis Avenue, a second 13- by 9.5-foot box culvert would be constructed.

A fish step pool system would be constructed at the confluence of Ross Creek for fish migration into Ross Creek. Baffles would be included in the design of the new RCB culverts for fish passage. Potential enhancement feature is to create pools, riffles, and low-flow channel using intermittent vortex rock weir for an additional cost of $1.8 million.

General Construction Procedures

Prior to construction of the box culvert under Almaden Expressway, a shoring system would be installed. The shoring system could consist of sheet piles or soldier piles with lagging.

After the installation of shoring system, the channel would be excavated. The box culvert bottom would be poured, followed by form work installation and pouring of the culvert walls and soffit. After completion of the culvert and removal of form work, backfill would be placed behind the culvert walls, and roadway paved.

Construction of the box culvert under Almaden Expressway would be staged so as to maintain three lanes open for traffic in each direction. Typically, this could be accomplished by construction of temporary roadways with a three-stage construction schedule. First, by utilizing the median and westerly shoulder, the northbound and southbound roadways would be relocated westerly to allow construction of ⅓ of the box culvert. Second, the northbound lanes would be moved easterly to allow the center ⅓ of the culvert to be constructed. Lastly, by utilizing the median, the southbound lanes would be moved easterly to allow the remaining ⅓ of the culvert to be constructed.

Construction of the box culvert under Jarvis Avenue would be similar to Almaden Expressway, except Jarvis Avenue would be temporarily closed and traffic would be detoured to Cherry Avenue.

Channel widening would consist of excavation, installation of ACM lining and boulders for vortex rock weir, and backfill the channel bottom. Structures which are damaged as a result of excavation would be repaired or replaced.

Water flowing in the creek during the culvert's construction and channel widening may be blocked and diverted around the construction area using pumps and pipes. Coffer dams will likely be needed for most construction. The California Construction BMP would be implemented.

Possible staging area for the construction equipment would be at Reach 11 construction areas. Access to the construction area would be Briarglen Drive, Cherry Avenue and Jarvis Avenue.

FISH BARRIERS UPSTREAM OF BLOSSOM HILL ROAD

Barriers that prevent fish from migrating upstream of Blossom Hill Road would be removed and access to 19 miles (see Table 3.19 of stream habitat restored). Figure 3.28 shows the location of the barriers.

Drop Structure Upstream of Blossom Hill Road

At the time the drop structure upstream of Blosson Hill Road was replaced in 1976, there was discussion with the California Department of Fish and Game regarding the need for a fish ladder. However, since there was no established fishery and poor water quality was an identified obstacle, there was no formal agreement or permit requirement for the District to construct the fish ladder.

In August 1995, the District entered into a court settlement agreement in response to a dispute with DFG. The agreement stipulates, in part, that the District ". . . shall construct a fish ladder or fishway at the twelve-foot drop structure that exists behind the Santa Clara Valley Water District Headquarters at Alamitos Creek, conforming to engineering and construction specifications approved in writing by the California Department of Fish and Game, to be fully operational by October 15, 1999."

A fish step pools system has been designed and proposed to be constructed on the east bank of the drop structure. The drop structure would be redesigned such that low flows and bankfull flows would continue in the fish step pool system. Existing stream flow gage station would be replaced in coordination with technical support staff. During migration season, debris, sediment, and all obstacles when found to impair passage of fish would be removed to keep the pool system open at all times.

Gabion Structures in the Alamitos Creek Upstream of Mazzone Drive

A series of vortex rock weirs with low flow passage would be constructed downstream of the existing gabion structure in the Alamitos Creek. These small weirs would be constructed 10 feet apart to create a sequence of plunge pools system. These pools would provide migrating adult fish with improved passage conditions by increasing pool depths, providing optimal hydraulic conditions within the pools, reducing the height between pools, and providing necessary resting habitat.

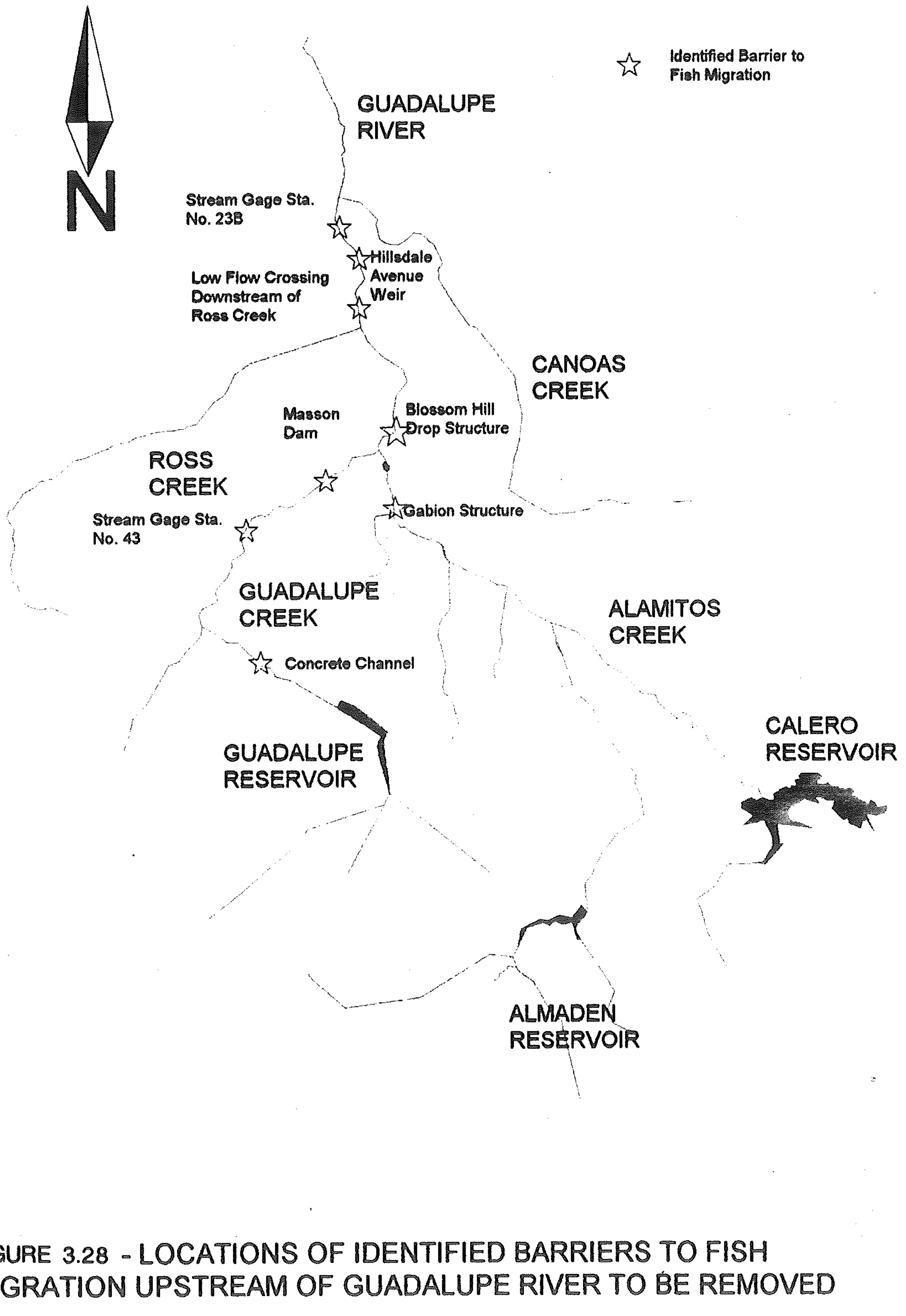


FIGURE 3.28 - LOCATIONS OF IDENTIFIED BARRIERS TO FISH MIGRATION UPSTREAM OF GUADALUPE RIVER TO BE REMOVED

TABLE 3.19
Summary of Creek Miles Created by Removal of Fish Barriers (Guadalupe River, Alamitos, Calero, and Guadalupe Creeks)

Fish Barrier Removed	Location	Fishway Length[1] Created (feet)	Fishway Length Created (miles)	Cumulative Fishway Miles Created	Creek Benefitted	Fishway Limit
Streamflow Station No. 23-B (1)	Guadalupe River	2,100	0.40	0.40	Guadalupe River	Hillsdale Avenue weir
Hillsdale Avenue weir (2)	Guadalupe River	3,550	0.67	1.07	Guadalupe River	Vehicle crossing downstream of Ross Creek
Vehicle crossing downstream of Ross Creek (3)	Guadalupe River	8,600	1.63	2.70	Guadalupe River	Blossom Hill drop structure
Blossom Hill drop structure (4)	Guadalupe River	1,650	0.31	3.01	Guadalupe River	Guadalupe River at Alamitos Creek, Guadalupe River at Guadalupe Creek confluence
Blossom Hill drop structure (4)	Guadalupe River	9,650	1.83	4.84	Guadalupe Creek[2]	Mason Dam
Ma$\overset{5}{\text{s}}$on Dam(5)	Guadalupe Creek	6,850	1.30	6.14	Guadalupe Creek	Streamflow Station No. 43
Streamflow Station No. 43 (6)	Guadalupe Creek	3,300	0.63	6.76	Guadalupe Creek	Concrete channel
Concrete channel (7)	Guadalupe Creek	3,750	0.71	7.47	Guadalupe Creek	Guadalupe Reservoir
Blossom Hill drop structure (4)	Guadalupe River	4,200	0.80	8.27	Alamitos Creek[3]	Gabion structure upstream of Mazzone Drive
Gabion structure upstream of Mazzone Drive (8)	Alamitos Creek	34,900	6.61	14.88	Alamitos Creek	Streamflow Station No. 16
Streamflow Station No. 16 (9)	Alamitos Creek	1,350	0.26	15.13	Alamitos Creek	Almaden Reservoir
Gabion structure upstream of Mazzone Drive (8)	Alamitos Creek	21,500	4.07	19.20	Calero Creek[4]	Arroyo Calero Reservoir
TOTAL FISHWAY MILES CREATED				19.20		
TOTAL fISH BARRIERS REMOVED				9		

[1] Length based on stations from District maps of flood control facilities and limits of 1% flooding (June 1993 editions).
[2] Fishway benefit starts from Guadalupe River at Guadalupe Creek confluence.
[3] Fishway benefit starts from Guadalupe River at Alamitos Creek confluence.
[4] Fishway benefit starts from Alamitos Creek at Arroyo Calero Creek confluence.

Confluence of Guadalupe and Alamitos Creeks

Vortex rock weirs would be installed at the confluence of Guadalupe and Alamitos Creeks to create pools, riffles, and low-flow channel. The low-flow channel would provide greater water depth for fish migration at minimum flows.

Masson Dam in Guadalupe Creek

A series of vortex rock weirs would be constructed downstream of the Masson dam in the Guadalupe Creek. These small weirs would be constructed 10 feet apart to create a sequence of plunge pools system. These pools would provide migrating adult fish with improved passage conditions at the dam.

Stream Gage 43 in Guadalupe Creek

The concrete foundation within the weir's plunge zone at Gage Station 43 in the Guadalupe Creek would be modified to allow water cresting over the weir to spill directly into the downstream pool. This modification would improve passage conditions for migrating adult fish by creating a more optimal hydraulics and by providing fish with access to the base of the weir.

Channelized stream in Guadalupe Creek between Pheasant Creek and Reynolds Road

A low-flow channel with rock baffles would be formed in an existing concrete channelized section in the Guadalupe Creek between Pheasant Creek and Reynolds Road. This modification would decrease the velocities and provide deeper water for fish migration.

MAINTENANCE PROGRAM

This section discusses the anticipated maintenance activities and guidelines to determine when channel maintenance is necessary. Upon completion of construction, the activities and guidelines presented in this chapter would supersede the existing maintenance program, which is performed according to the current MOU with the CDFG (Appendix K and L).

Maintenance Activities

The project will have a maintenance program which will include erosion protection, vegetation removal, and sediment removal. The goals of the maintenance program include restoring the facilities to the design condition, which existed following construction, repairing the facility as necessary and eliminating hazardous conditions. The hazardous conditions include eroding banks, presence of large dead or fallen trees, and excessive trash and debris.

The general tasks to be performed during annual maintenance include damaged gabion and fencing repairs, trash and debris removal, weed control, and elimination of potentially hazardous conditions. Annual inspection and periodic removal of sediment and woody vegetation in the waterway, and restoration of abraded concrete and damaged diversion structures will also be necessary.

Vegetation and sediment would be allowed to accumulate to a predefined level at which time the design condition will be restored by maintenance activities. The vegetation will provide additional unaccounted for, habitat value and shading during the time between maintenance cycles. Therefore, there would be no adverse impacts from the vegetation removal activities and no mitigation would be required. If sediment never reach the predefined level, maintenance would not be required.

Sites which are actively eroding would be subjected to progressively increasing remedial actions. Severe erosion resulting in potentially hazardous steep banks, bare soil and loss of vegetation is environmentally more impacting than providing protective measures.

Because structural measures are only initiated when the vegetation has already been lost from erosion of the bank and the steep undercutting is unlikely to revegetate naturally, there would not be any environmental impact associated with most remedial repair options. Therefore no mitigation would be required. Mitigation may be required for some repairs. Figure 3.29 shows the examples of before and after high flows banks condition in the Guadalupe River.

Nonemergency work within the channel will be performed outside of the nesting season. Vegetation removal will be scheduled to minimize adverse impacts to fish and wildlife resources. Periods of concern are March through June for birds and October through March for fish.

Maintenance Program for Erosion Repair

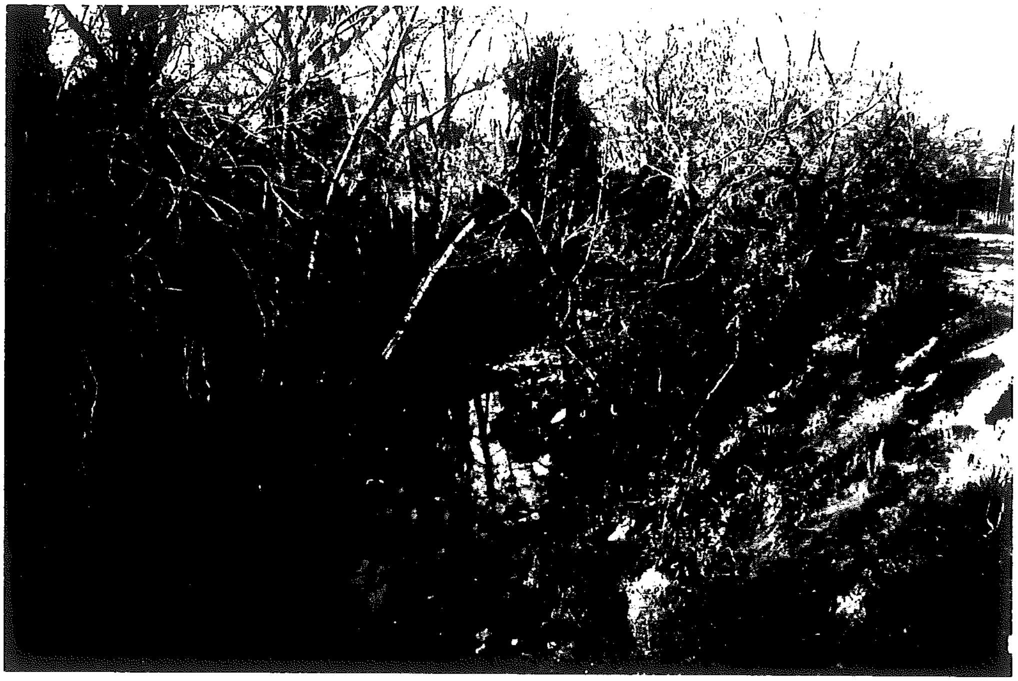
Soil erosion in Guadalupe River occurs on the channel banks. As bank erosion occurs, vegetation is lost, habitat is lost, property improvements may be threatened, and channel capacity may be compromised. Increased soil erosion on the channel banks increases suspended sediment in the creek consequently degrading water quality and aquatic habitat.

Sites which are actively eroding will be subjected to either (1) preventative slope protection, or (2) remedial slope protection. Preventative slope protection will be implemented at sites where creek banks are first becoming undercut up to 8 feet vertical (see Figure 3.30). Remedial slope protection will be implemented at sites where preventative maintenance was implemented and failed; where preventative maintenance is highly unlikely to be sufficient to eliminate continued bank erosion; or where the erosion is more than 8 feet vertically on the bank (see Figure 3.30).

1. Preventative Slope Protection

   Preventative slope protection consists of protecting the channel bank toe to stabilize the zone of highest erosion potential. The toe of the bank will be stabilized by placement of 1/2-ton rock riprap to a height of at least 4 feet (see Figure 3.31). The riprap will reduce the velocity of flow at the interface and will promote the natural sedimentation around the riprap, and therefore, natural revegetation.

   If it is observed that the channel bottom is actively degrading, vortex rock weirs will be installed downstream of the channel bank erosion to prevent any further degradation (Figure 3.32). Bank instability and erosion may, in some cases, be directly correlated to increased bank height due to channel bottom degradation.



Looking Downstream Along Almaden Road Downstream of Malone Road

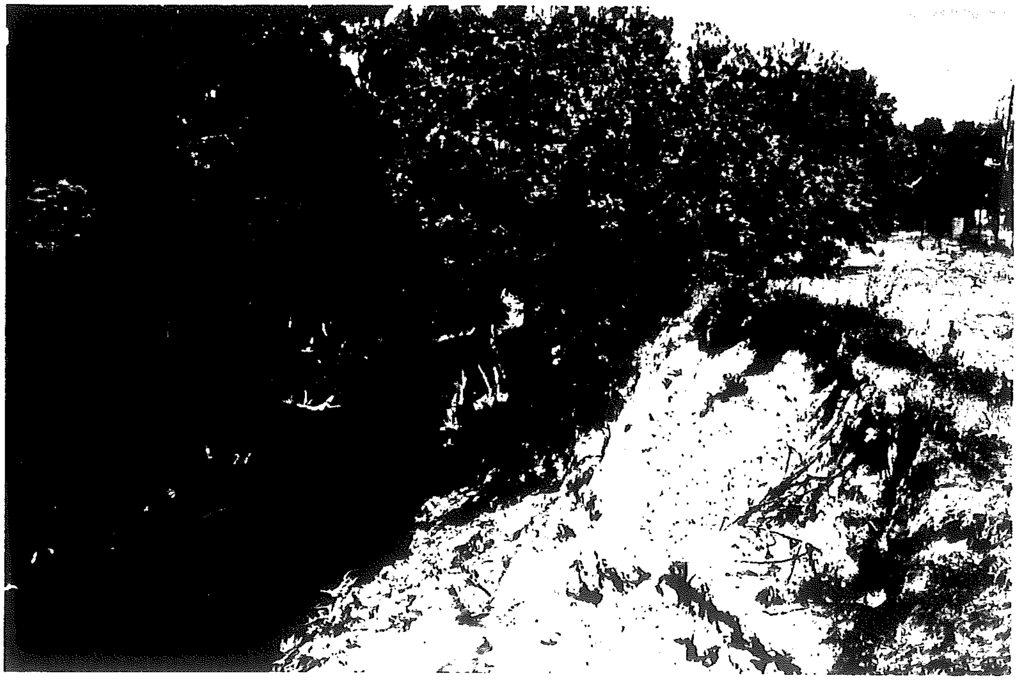
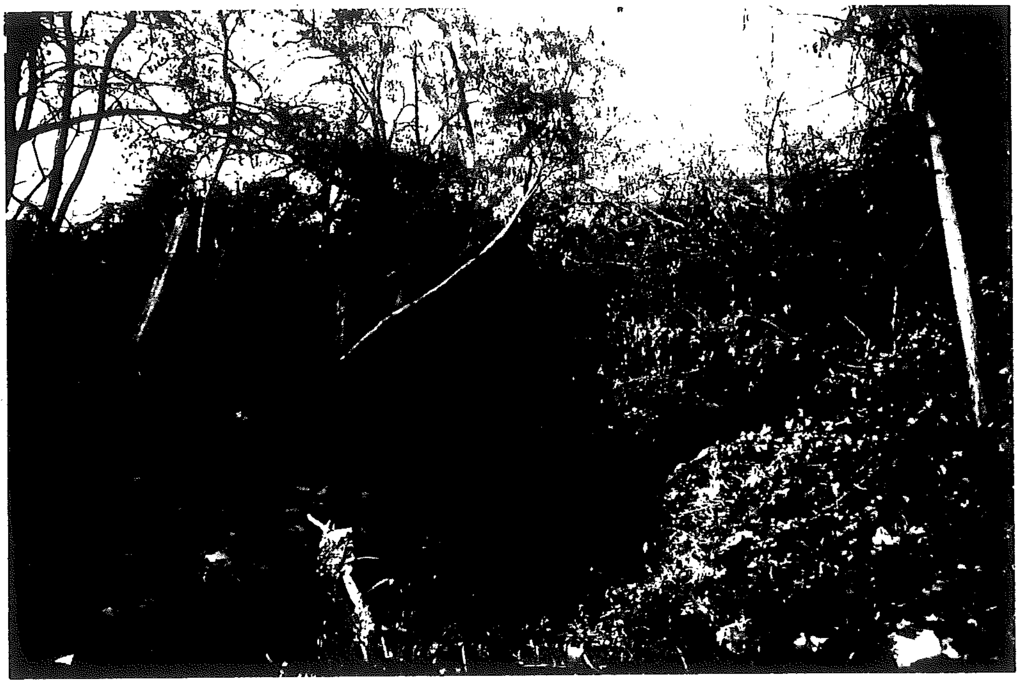


FIGURE 3.29
BEFORE AND AFTER JANUARY AND MARCH 1995 FLOODINGS



Looking Downstream Along Almaden Road Upstream of Malone Road

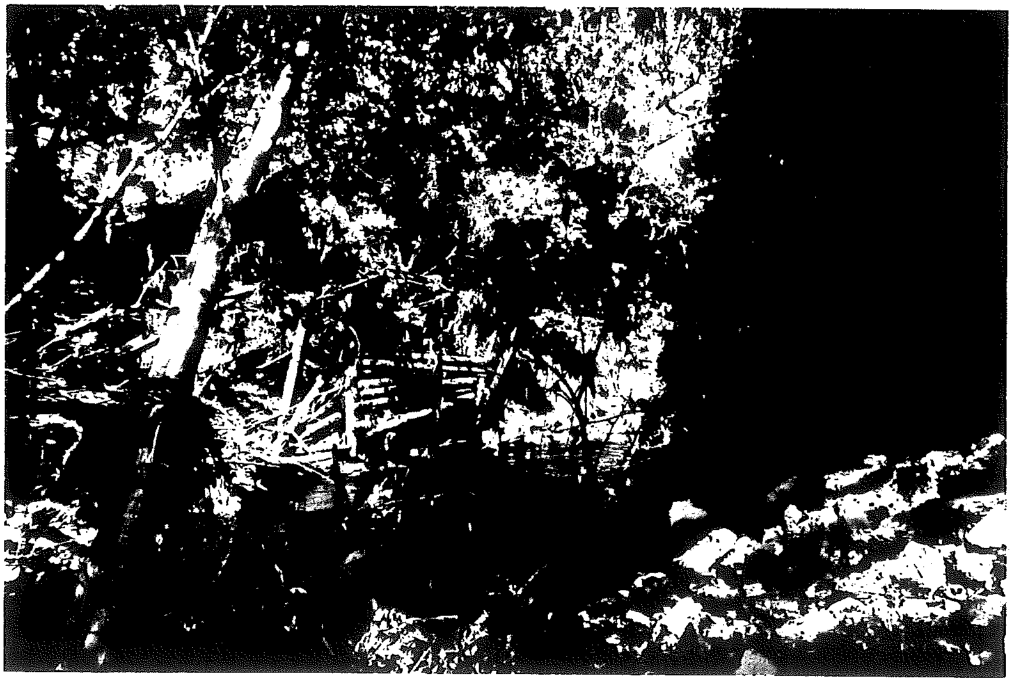
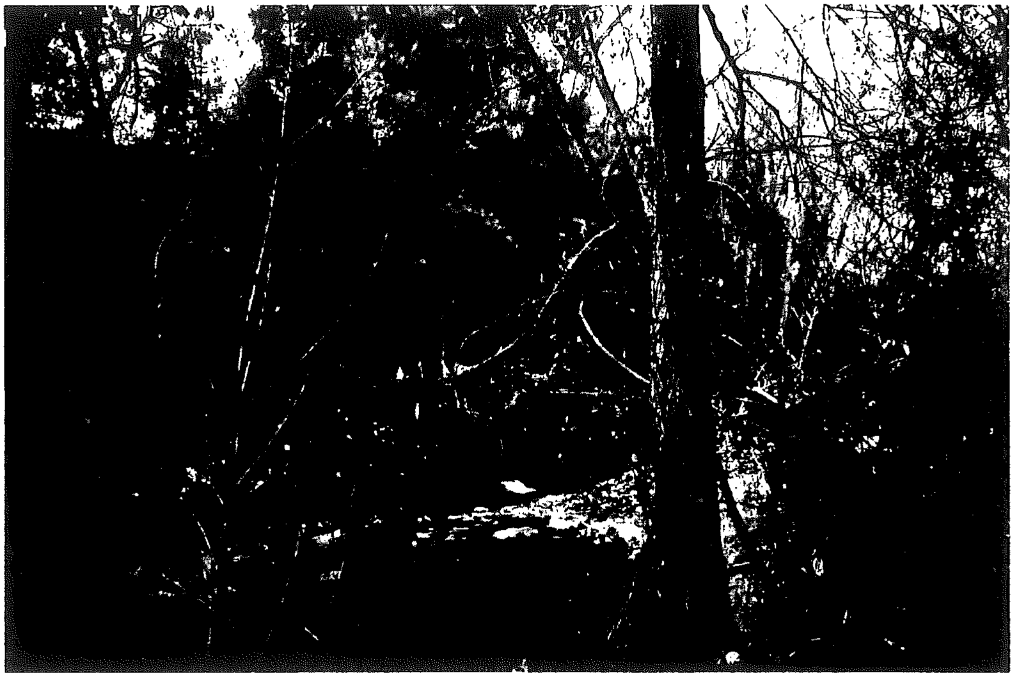


FIGURE 3.29 (CONT'D)
BEFORE AND AFTER JANUARY AND MARCH 1995 FLOODINGS



Looking Downstream Along Almaden Road Downstream of Curtner Avenue

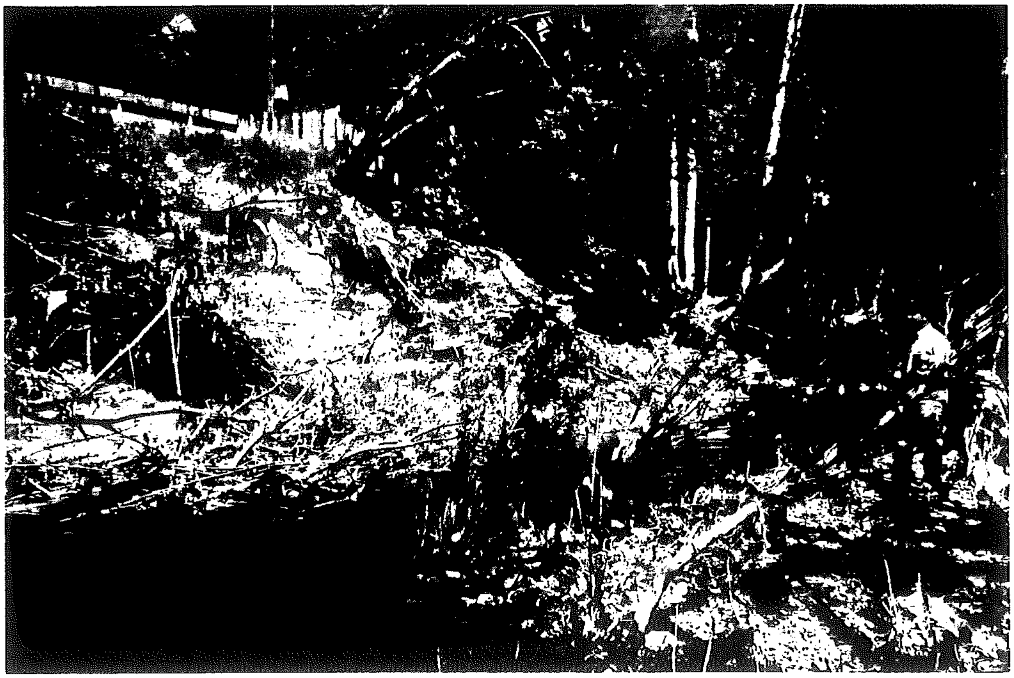
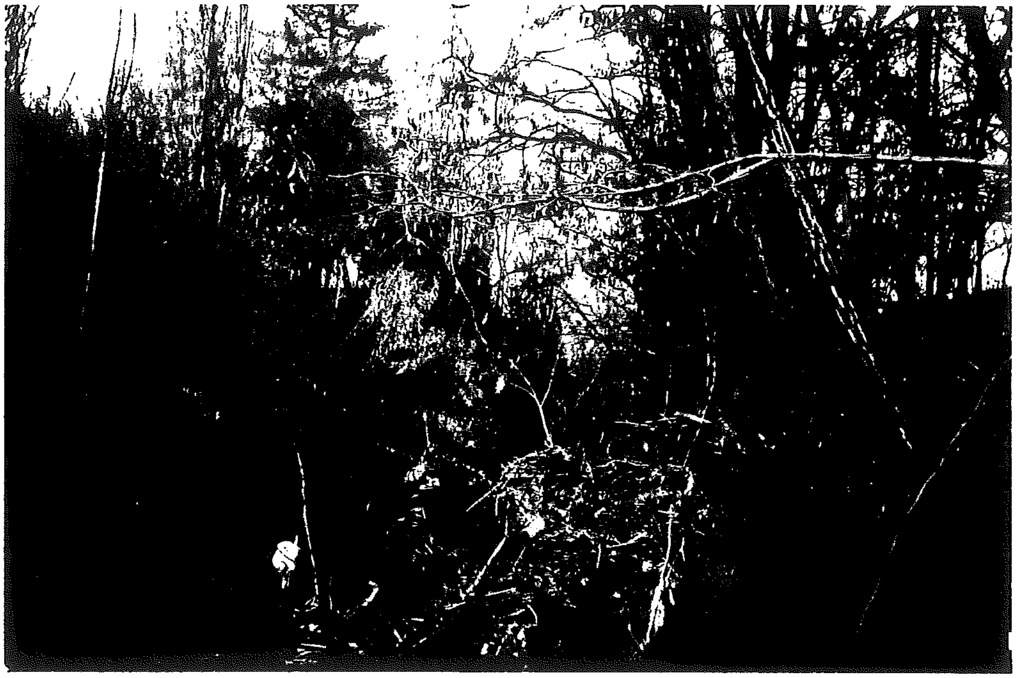


FIGURE 3.29 (CONT'D)
BEFORE AND AFTER JANUARY AND MARCH 1995 FLOODINGS



Looking Downstream Along Almaden Road Upstream of Curtner Avenue

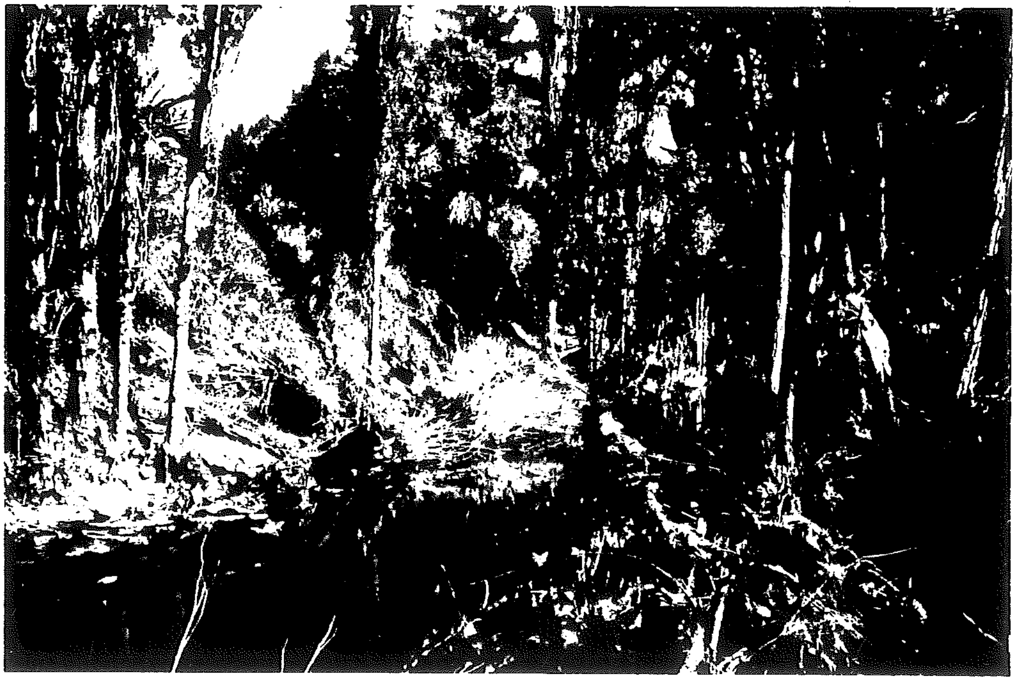


FIGURE 3.29 (CONT'D)

BEFORE AND AFTER JANUARY AND MARCH 1995 FLOODINGS

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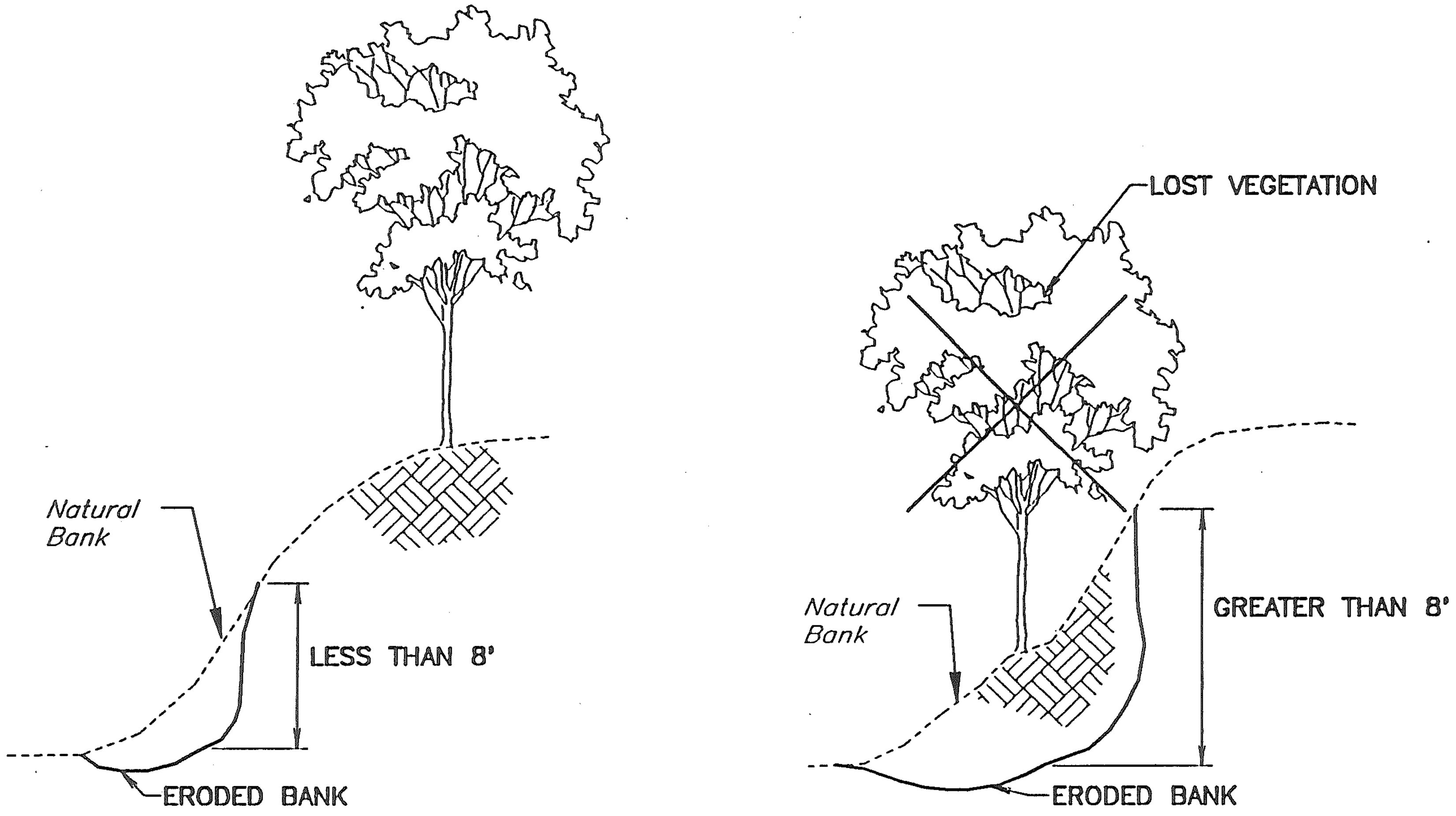
FIGURE 3.30
EROSION SYMPTOMS



PREVENTATIVE EROSION SYMPTOMS

REMEDIAL EROSION SYMPTOMS

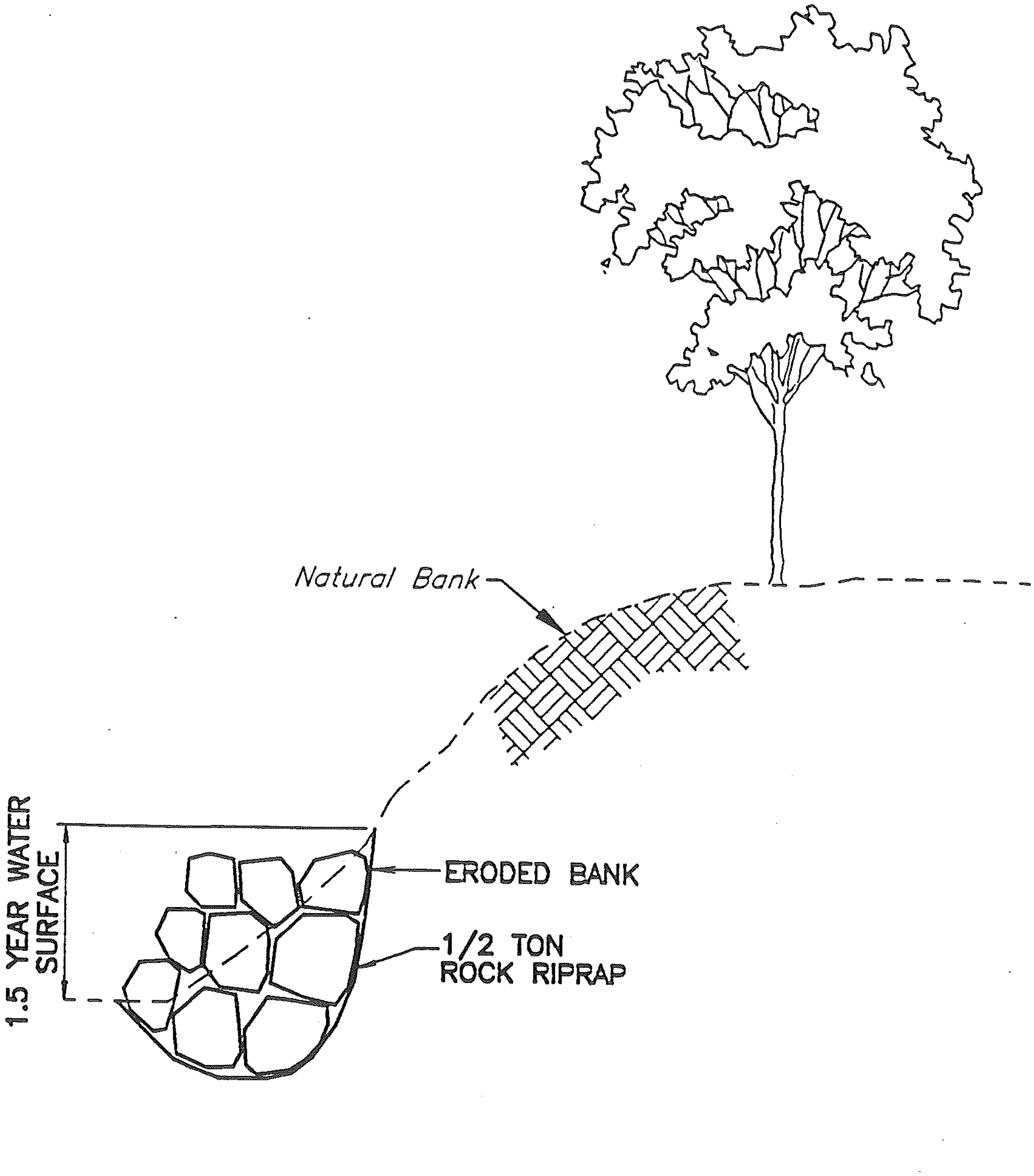
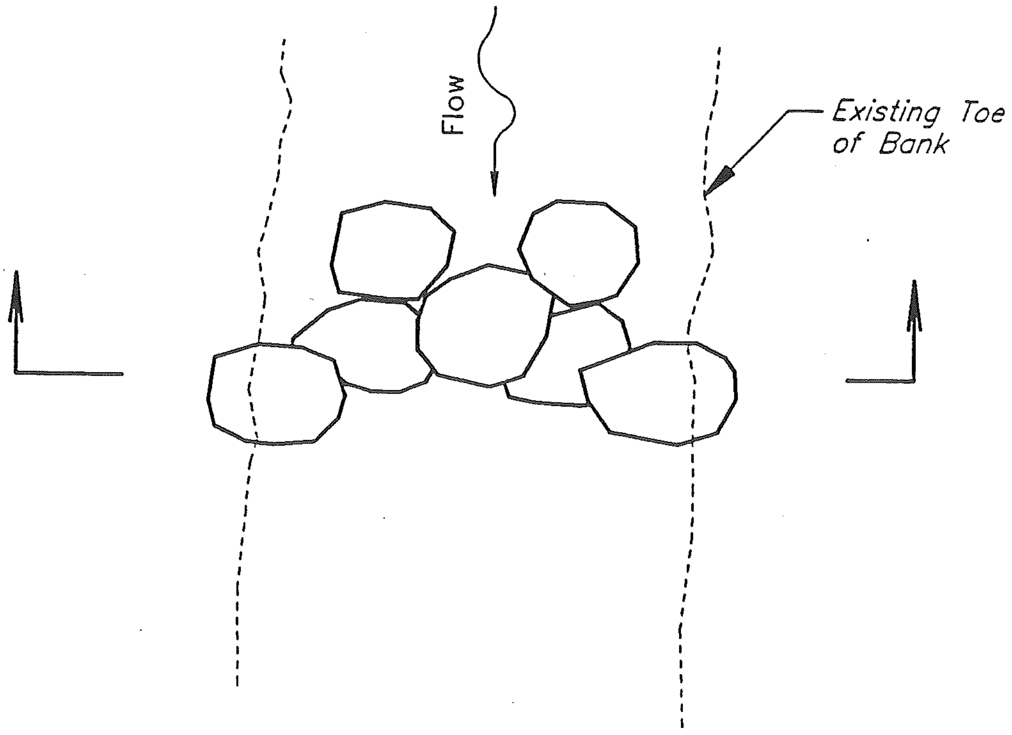
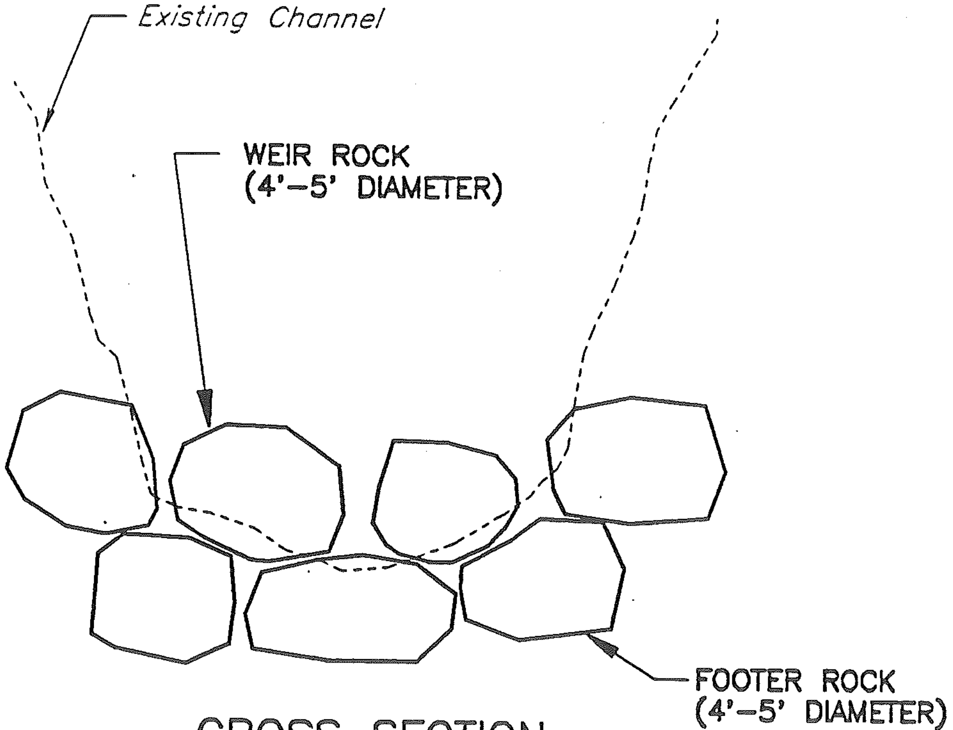


FIGURE 3.31
PREVENTATIVE EROSION SOLUTION

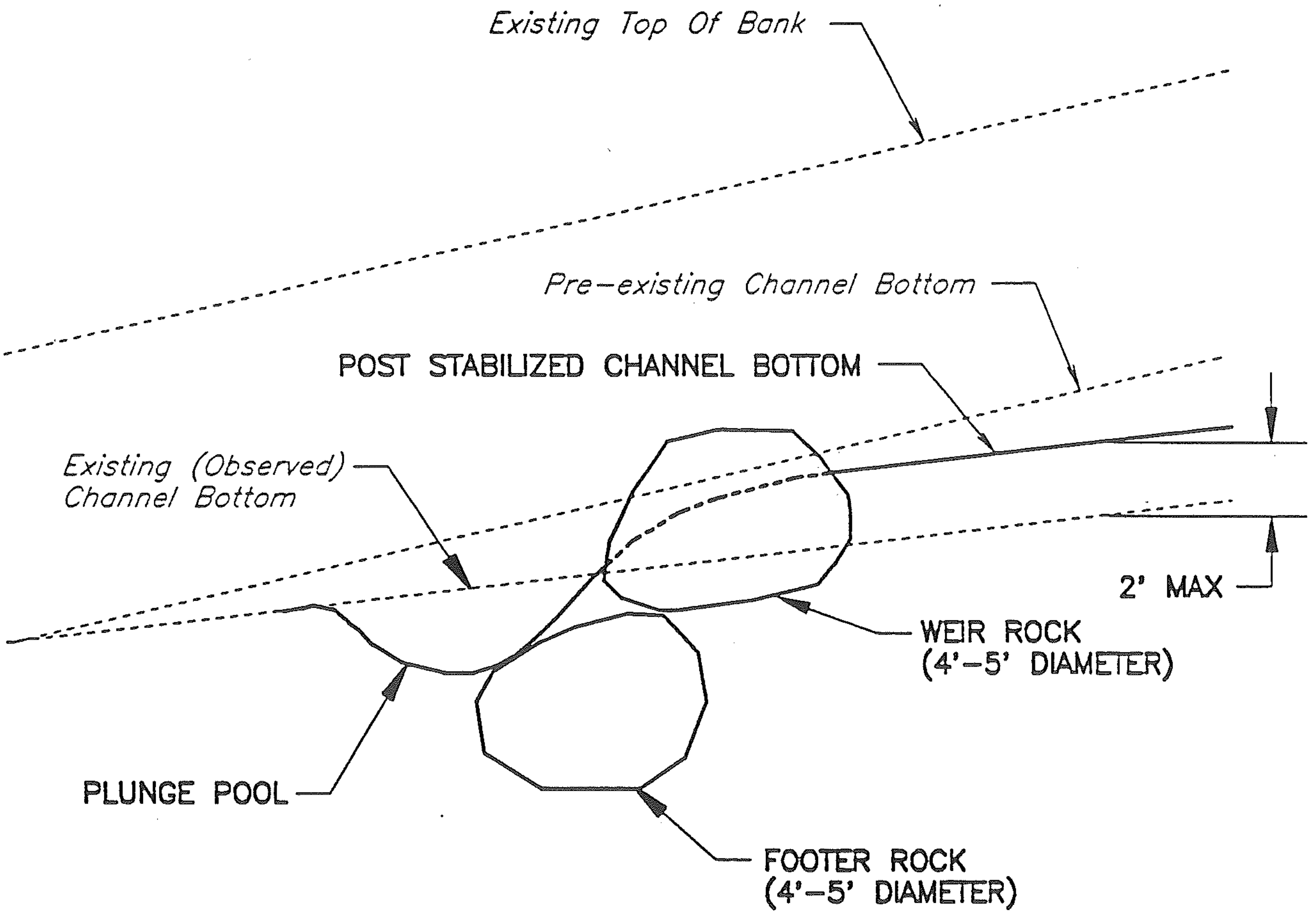


PLAN VIEW



CROSS SECTION

FIGURE 3.32
VORTEX ROCK WEIR


Existing Top Of Bank
Pre-existing Channel Bottom
POST STABILIZED CHANNEL BOTTOM
Existing (Observed) Channel Bottom
2' MAX
WEIR ROCK (4'-5' DIAMETER)
PLUNGE POOL
FOOTER ROCK (4'-5' DIAMETER)

PROFILE

FIGURE 3.33
VORTEX ROCK WEIR PROFILE

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The vortex rock weir will be constructed with large boulders vary from 3 to 5 feet in diameter and will be keyed into the bank to eliminate erosion. The weir is constructed in a U-shape, with the point of the "U"facing upstream and span at the minimum the bankfull channel width. This forms a vortex that creates a downstream plunge pool for energy dissipation and aquatic habitat. Footer rocks will be installed for anchoring and prevent undermining.

The weir will provide instream cover and deepen the feeding areas for fish habitat in the riffle reach of the channel. It acts as a grade control structure without upstream lateral migration, bank erosion and aggradation. It also maintains a low width to depth ratio channel which will reduce the likelihood of bar deposition and maintains the sediment transport capacity of the stream.

Vortex rock weirs will be limited to approximately 2 feet in height as shown in Figure 3.33. If more height is needed to stabilize the channel, multiple weirs will be installed.

2. Remedial Slope Protection

Remedial slope protection consists of using nonstructural and structural measures. The nonstructural alternatives would be to regrade the channel banks to a stable configuration. This alternative works best where right of way and mature vegetation does not impose constraints on the available space in which to regrade the channel banks. Acquisition of right of way is a nonstructural measure which may be appropriate when the cost of structural measures are high. In restricted right of way, structural alternatives often are the only viable alternatives that adequately stabilize the channel banks.

Structural measures can be divided into three categories: live construction, mixed construction, and inert construction. Live construction consists of the traditional use of grass and live cuttings. Mixed construction consists of using plant materials often combined with inert materials (rock riprap, gabions, cribwalls, etc.). Live construction and mixed construction, when covered with soil as proposed, or when supplemented with hydroseeding and plantings, will eventually restore the creek bank vegetation and habitat to near the condition which existed prior to the erosion occurring. Inert construction consists of using only inert structural methods.

The various structural alternatives are appropriate for different site conditions. Erosion protection works will be selected when technically feasible to reduce adverse environmental impacts. The objective when selecting erosion protection materials is to meet both engineering and environmental impact criteria. The engineering criteria involve the physical ability of the material to provide reliable structural support within the site constraints, including the ability of the material to provide lateral support to the bank, as well as, provide sustained protection against erosive velocities. The environmental impact criteria used in selecting the remedial measure follows the CEQA guideline for mitigation, which is avoiding impacts, minimizing impacts, rectifying impacts, reducing impacts over time, and compensating for impacts. Once erosion on the earth channel has occurred, the site constraints determined, cause or erosion determined, and ecological setting evaluated, the remedial measures are considered and selected. Depending on the impacts to the environment and the materials availability, the remedial slope protection measures will first be considered **in order as described below**. (See Table 3.20 for summary of remedial slope protection methods.)

Live Construction

Live construction consists of using traditional methods of planting grasses and vegetation to control erosion. Vegetation planting methods typically used are cuttings, transplants, live staking, and direct seeding (including hydro-seeding).

This application is suitable for bank slopes up to 2:1 and flow velocities up to 4 feet per second. Live construction would not be feasible for the Guadalupe River, south of Highway 101, since design channel velocities exceed 4 feet per second.

Mixed Construction

Mixed Construction meets one of the District's goals in keeping current with innovative technologies that serve the public interests, including materials that integrate resource agency goals. This construction method usually involves some bank disturbance and consists of using plant materials often combined with inert materials. Subcategories of Mixed Construction are Soil Bioengineering and Biotechnical Slope Protection.

Soil Bioengineering

Soil Bioengineering consists of using plants and plant parts to control soil erosion. Live cuttings and plant parts are imbedded and arranged so that they act as soil reinforcements, hydraulic drains, or barriers to earth movement. Methods included in this category include contour wattling, brush layering, and bank surface matting.

—Contour Wattling

Contour wattling consists of long bundles of plant stems tied together with twine, anchored in shallow trenches with wooden stakes, and partially backfilled with mildly compacted fill (see Figure 3.34). When the stems develop root systems and mature, the plant (typically willows) establishes structural stabilization properties within the soil root fabric. Protection from erosive flow velocities result from the protective armoring quality provided by the plant's stems and leaves.

This application in suitable for bank slopes up to 2:1 and flow velocities up to 6 feet per second.

TABLE 3.20
Summary of Remedial Slope Protection Methods

Erosion Control Technique				
Category	**Method**	**Slope Requirements**	**Flow Velocity Requirements**	**Additional Information**
Live construction	Planting grasses, cuttings, transplants, live staking, seeding	2:1 or flatter	4 fps[1] or less	Not feasible on Guadalupe River due to excessive channel velocities.
Mixed construction—soil bioengineering	Contour wattling	2:1 or flatter	6 fps or less	Plant roots protect soil. Creates benches or terraces to create flat areas. Limited use on Guadalupe River due to high creek velocities.
	Brush layering	2:1 or flatter	6 fps or less	Similar uses and restrictions to contour wattling.
	Bank surface matting	2:1 or flatter	6 fps or less	May be combined with live staking or direct seeding. Similar uses and restrictions to contour wattling.
Mixed construction—biotechnical slope protection	Root wads and boulders	Varies	6 fps or less	For use on the outside of eroding bends. 20 feet of horizontal depth is needed for installation.
	Soil cellular confinement system (structural design)	½:1 or flatter	6 fps or less	Cells are filled with soil and planted with vegetation. Matrix is not biodegradable.
	Rock riprap	1½:1 or flatter	15 fps or less	May be used for preventative as well as remedial protection. May be combined with live staking or direct seeding.
	Gabions	¾:1 or flatter	15 fps or less	Can be planted but vegetation potential is limited.
	Articulated concrete mat	1:1 or flatter	15 fps or less	Can be planted with live staking or direct seeding. Plant growth is restricted to size of cell openings.
	Crib walls	¼:1 or flatter	15 fps or less	Crib walls restrict plant growth due to size of openings. Vegetation improves stability.
Inert construction	Sacked concrete slope protection	½:1 or flatter	15 fps or less	No revegetation potential.
	Gunite	All slopes to vertical	15 fps or less	No revegetation potential.

[1] fps = feet per second

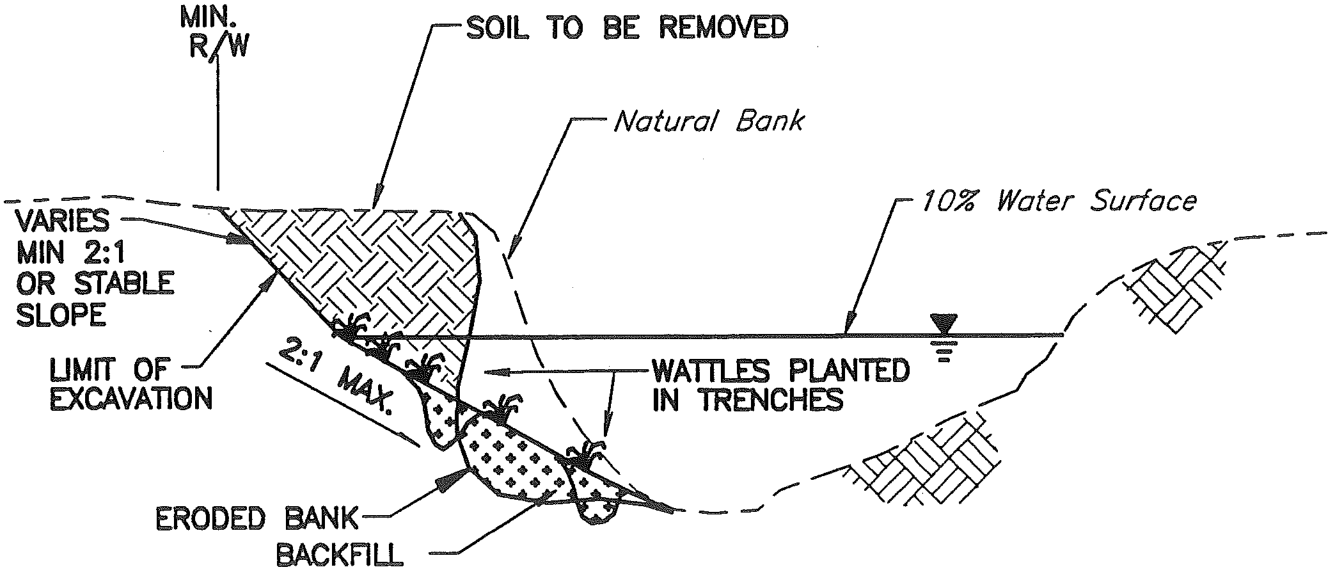


FIGURE **3.34**
CONTOUR WATTLING

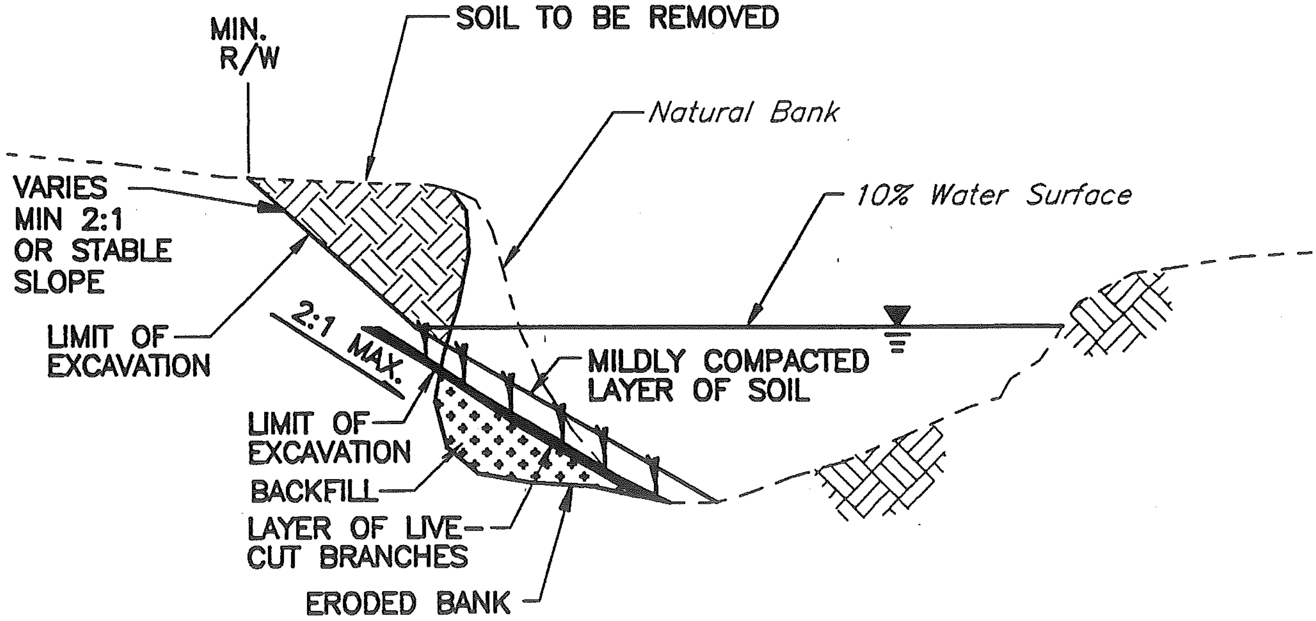


FIGURE **3.35**
BRUSH LAYERING

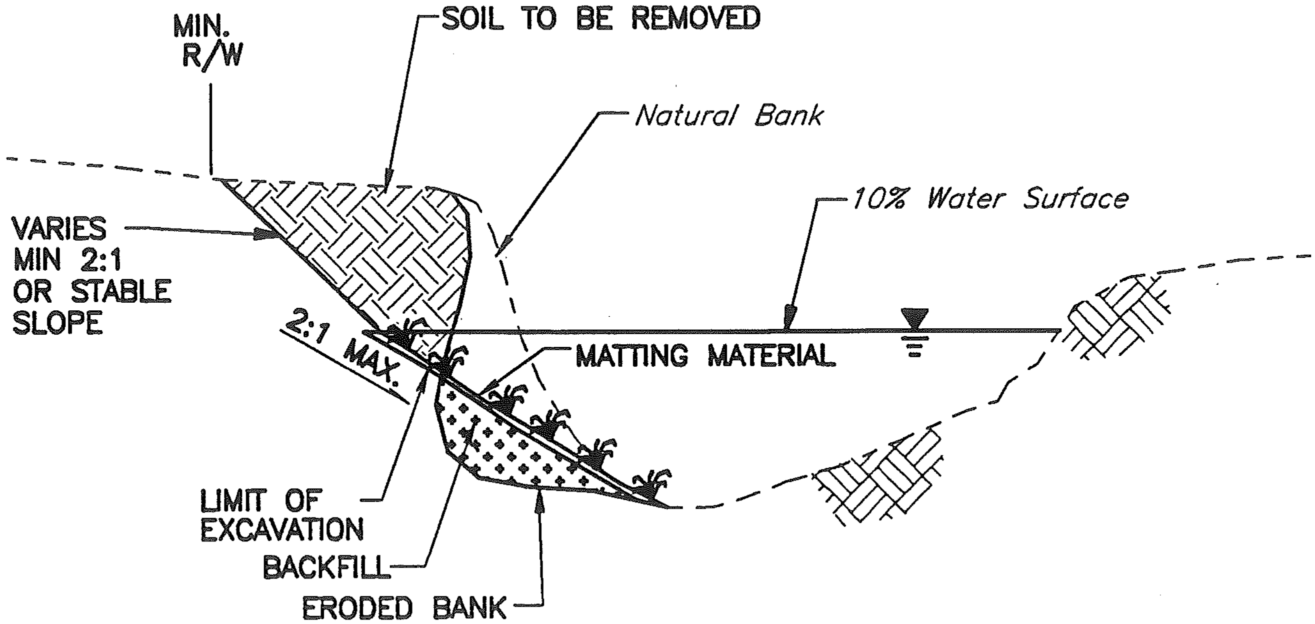


FIGURE **3.36**
BANK SURFACE MATTING

—Brush Layering

Brush layering consists of placing live cut branches on the bank and covering them with a lightly compacted layer of soil (see Figure 3.35). The tips of the branches extend out of the bank thus slowing down overbank flow and trapping bank sediment. After the branches take root along their length, they begin to act like horizontal slope drains on the bank.

Similar to live construction, this method provides good revegetation potential. This application is suitable for bank slopes up to 2:1 and flow velocities up to 6 feet per second.

—Bank Surface Matting (Erosion Mats)

Bank surface matting consists of securing plastic, jute, or geotextile fabric surface liners to eroded banks using stakes or staples (see Figure 3.36). These materials provide armor protection against erosive velocities and may be combined with live staking or direct seeding.

This application has good revegetation potential, but like contour wattling, it is limited to bank slopes up to 2:1 and flow velocities up to 6 feet per second.

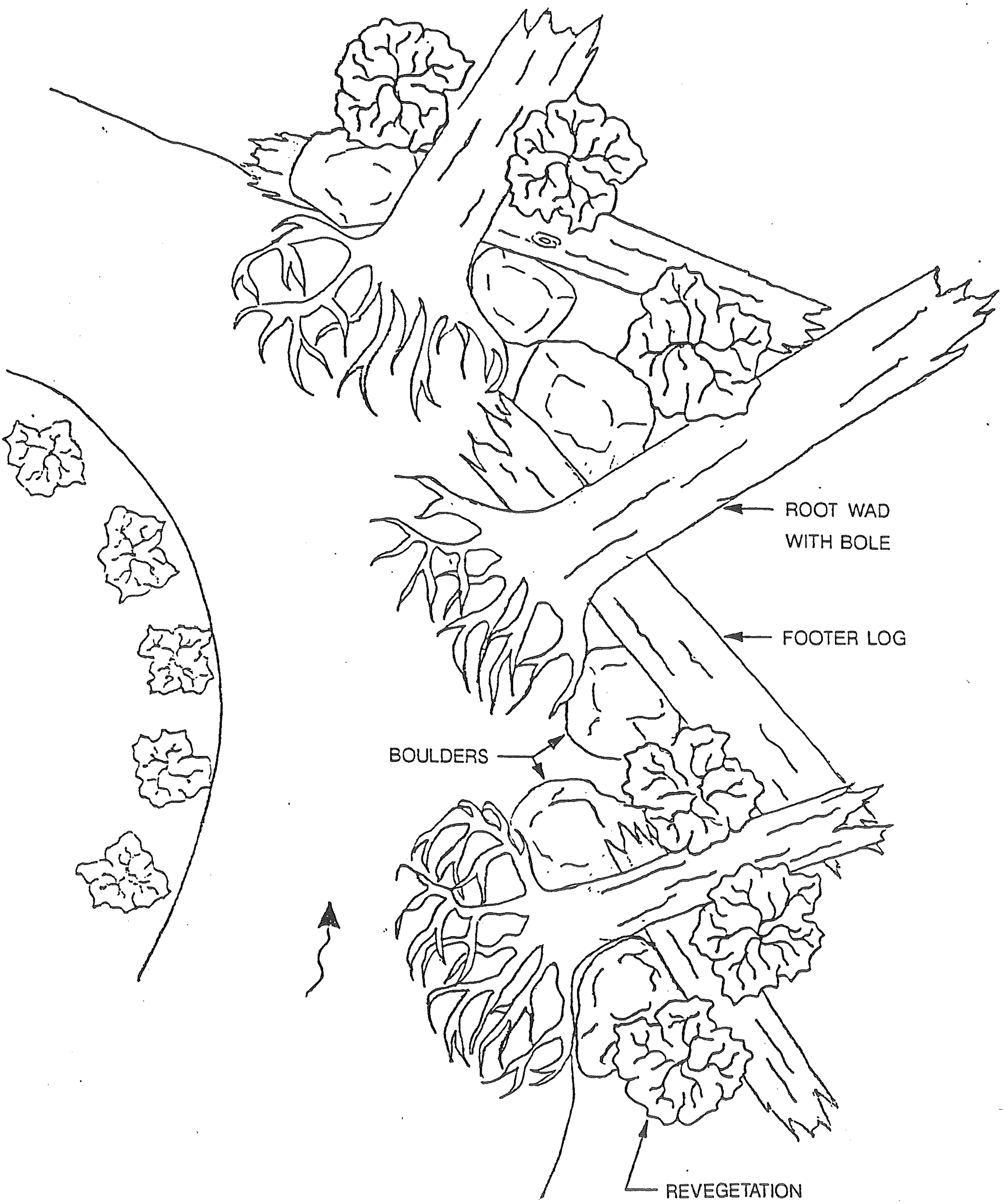
Biotechnical Slope Protection

Biotechnical Slope Protection combines live vegetation with inert material to control erosion. Any inert structure that is porous or has openings can lend itself to Mixed Construction by planting some type of vegetation on it. Methods in this category include root wads and boulders, soil cellular confinement system, rock riprap, gabions, articulated concrete blocks, and cribwalls.

—Root Wads and Boulders

The root wads and boulders repair method consists of placing tree root wads and interspersed boulders in eroding bends of the creek (Figures 3.37 and 3.38). The root wads are placed pointing into the flow direction and the boulders (4 to 5 feet in diameter) are placed in between the wads to hold them in place and set the spacing between them. In addition to the boulders, a log called a footer log is used to support the root wad from below and another log is placed over the rood wad to hold it from above. The root wads used will have a minimum of 10 feet of tree trunk or bole still attached to the root. This tree trunk adds stability to the repair. After the root wads, boulders, and supporting logs are put in place, soil is placed on top, sloped bank, and live staked.

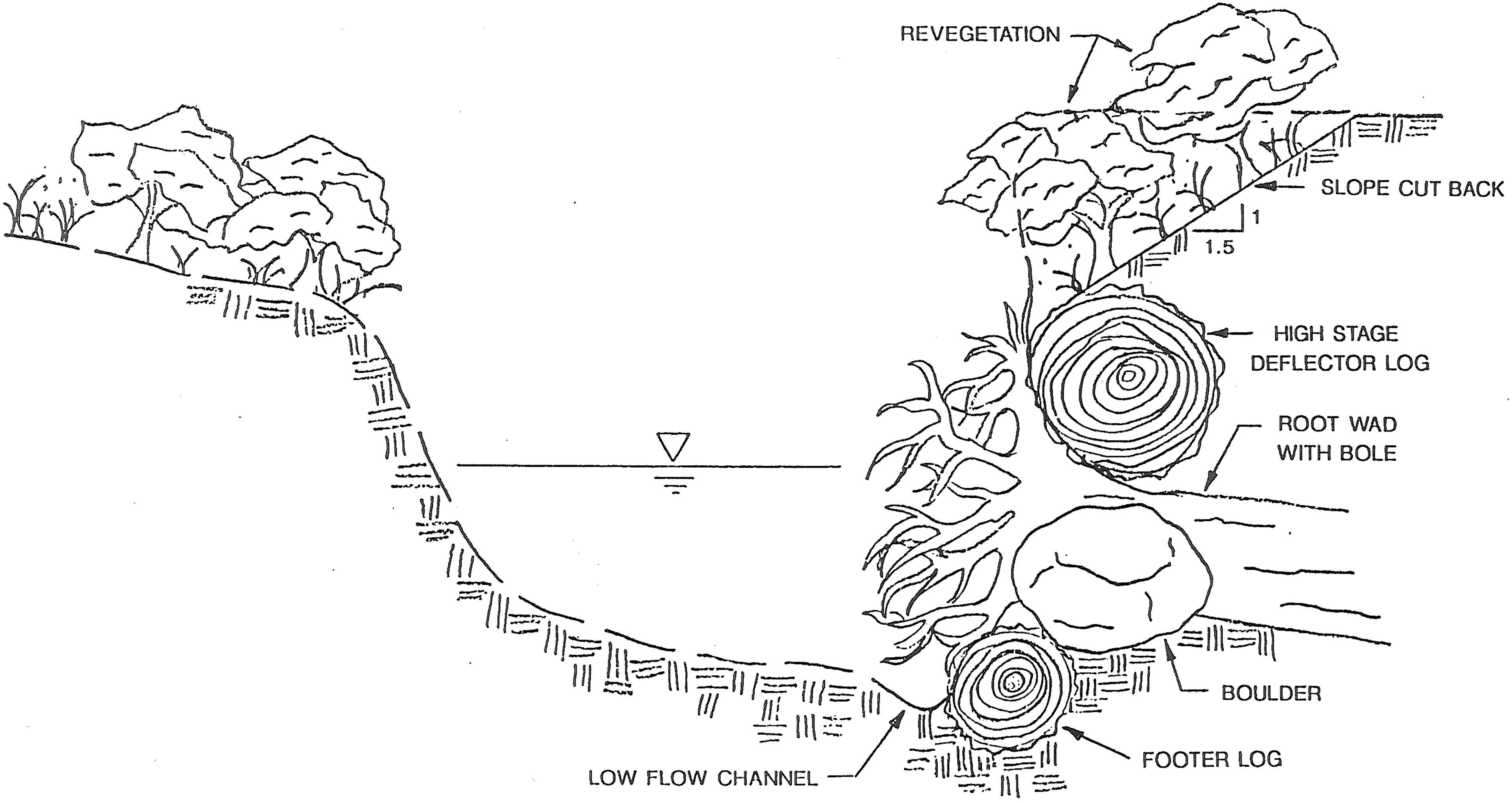
This method has a drawback in that about 20 feet of depth is needed for installation. When installed correctly, this method can be applied where expected velocities are within normal ranges. The longevity of this method is also governed by the type of trees that are used and the amount of time during the year that they are wet.



ROOT WADS AND BOULDERS

PLAN VIEW

FIGURE 3.37



ROOT WADS AND BOULDERS
TYPICAL CROSS SECTION

FIGURE 3.38

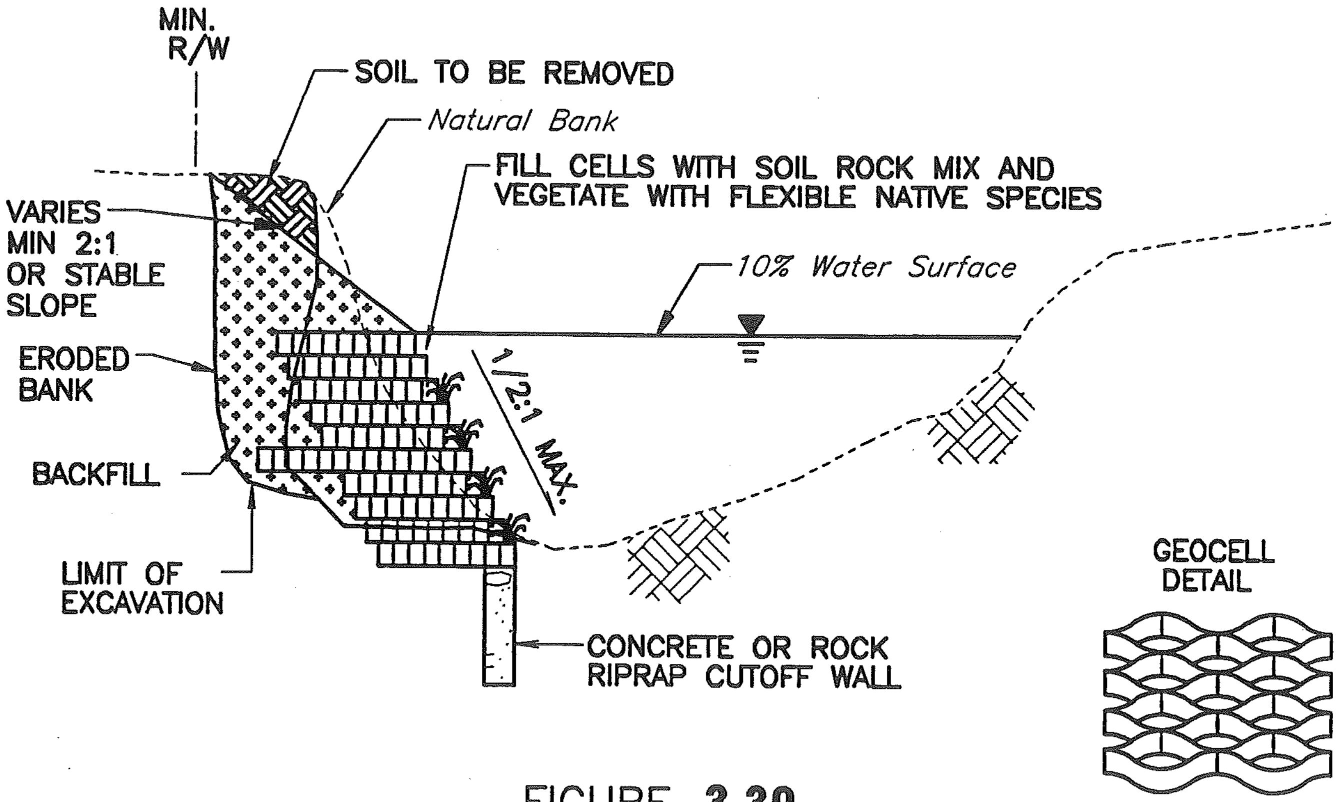

MIN.
R/W
SOIL TO BE REMOVED
Natural Bank
FILL CELLS WITH SOIL ROCK MIX AND VEGETATE WITH FLEXIBLE NATIVE SPECIES
VARIES MIN 2:1 OR STABLE SLOPE
10% Water Surface
ERODED BANK
1/2:1 MAX.
BACKFILL
LIMIT OF EXCAVATION
GEOCELL DETAIL
CONCRETE OR ROCK RIPRAP CUTOFF WALL

FIGURE **3.39**
SOIL CELLULAR CONFINEMENT SYSTEM (GEOCELL)

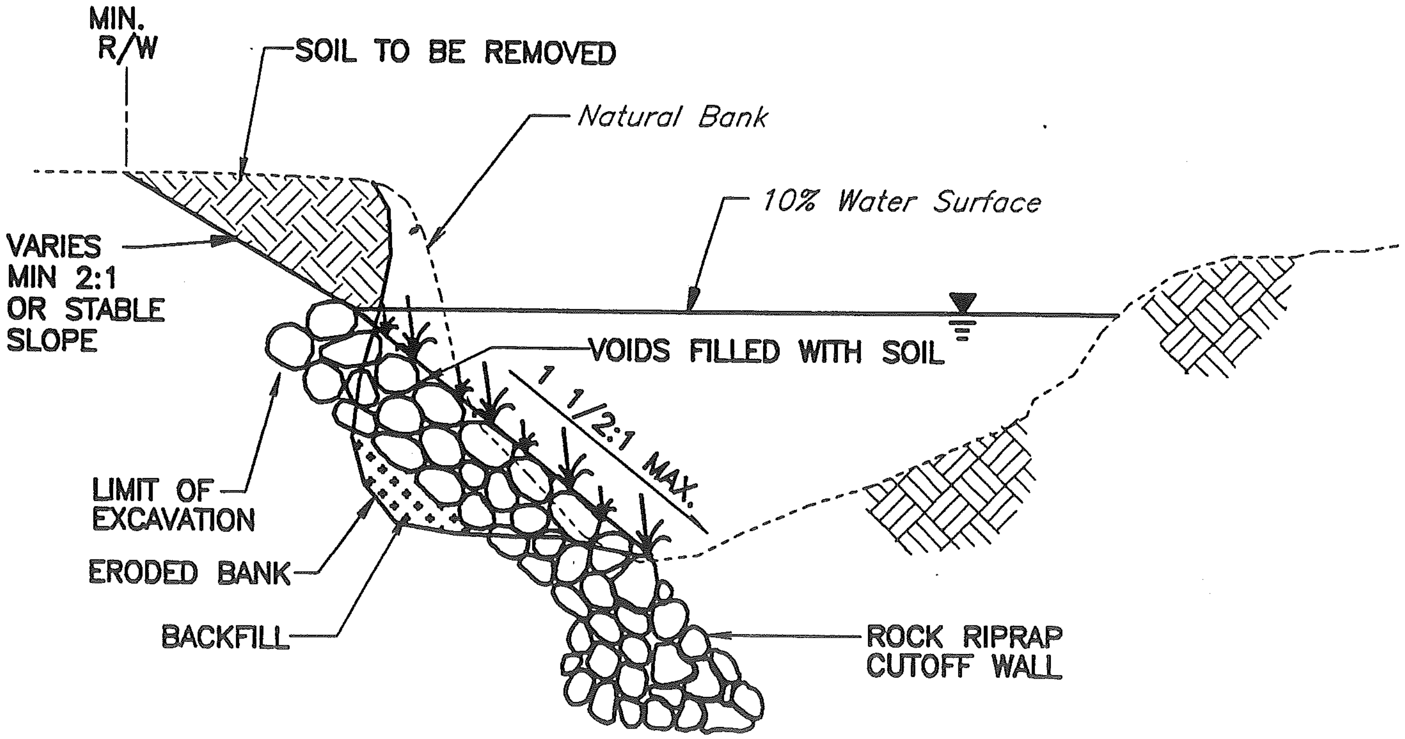


FIGURE **3.40**
ROCK RIPRAP

W:\DWGS\P\1010_101\A_SIZE\ACXS0008.DWG

—Soil Cellular Confinement System (Geocell)

Soil cellular confinement system or geocell is a polyethylene plastic cellular system where structural strength is developed by a composite design of soil, plant roots, and the plastic cellular configuration (see Figure 3.39). This system is available in 8-inch deep honeycomb mats that are 32 to 96 inches wide and in 8-foot lengths. This structure functions similar to a cribwall structure. It is installed in offset vertical layers to create plantable terraces. The honeycomb terrace cells are filled with soil, moderately compacted and planted with woody and herbaceous vegetation to augment structural qualities.

This application is suitable for slopes flatter than 2:1 to steep slopes up to 1/2:1 and with flow velocities up to and exceeding 6 feet per second. However, the revegetation potential of this method is not as good as Live Construction or Soil Bioengineering methods.

—Rock Riprap

Rock riprap consists of placing rock rip rap on the bank slope to eliminate erosion at the toe and on the bank of the slope (see Figure 3.40). Rock sizes can vary from 6 inches to 4 feet in diameter. The rocks selected should be large and uniform enough, so soil can be placed between the rocks and planted by live staking or direct seeding (joint planting).

This application is suitable for bank slopes up to 1.5:1 and flow velocities up to 15 feet per second. Rock riprap provides some opportunity for revegetation but slightly less than soil cellular confinement system.

—Gabions

Gabions consist of wire baskets filled with 6-inch diameter rocks that are placed on scoured banks either as sloping mattresses or stacked in layers that resemble steps (see Figure 3.41). This material requires a concrete, gabion, or rock cutoff wall if no other invert protection is provided. Designs can accommodate revegetation goals and maintain bank moisture through ground water migration or surface infiltration. Gabions can be revegetated by leaving pockets without gabions open to bare soil that can be planted with trees or shrubs (see Figure 3.42).

Their application is suitable for bank slopes varying from flatter than 3:1 to as steep as 3/4:1 and flow velocities up to 15 feet per second. Gabions have revegetation potential but less than rock riprap.

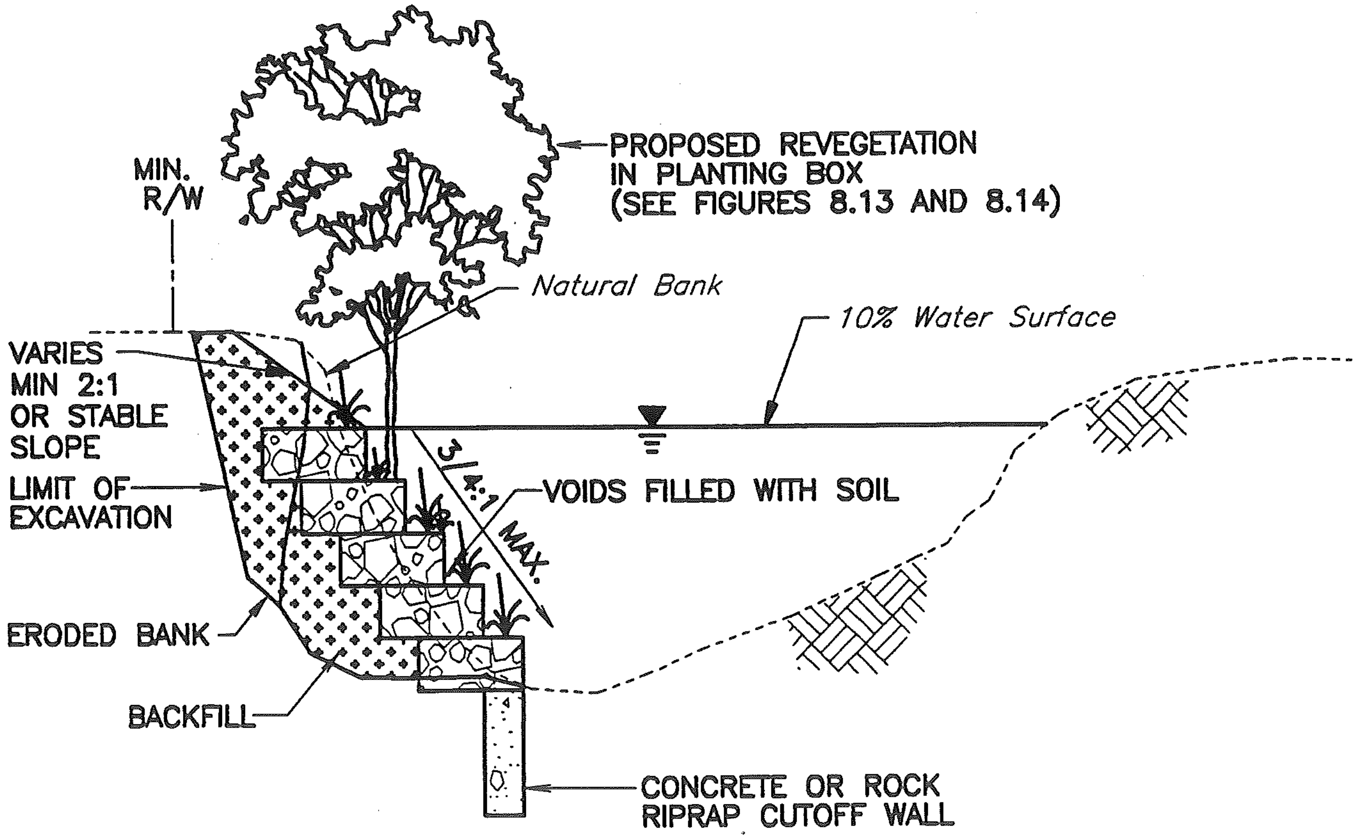
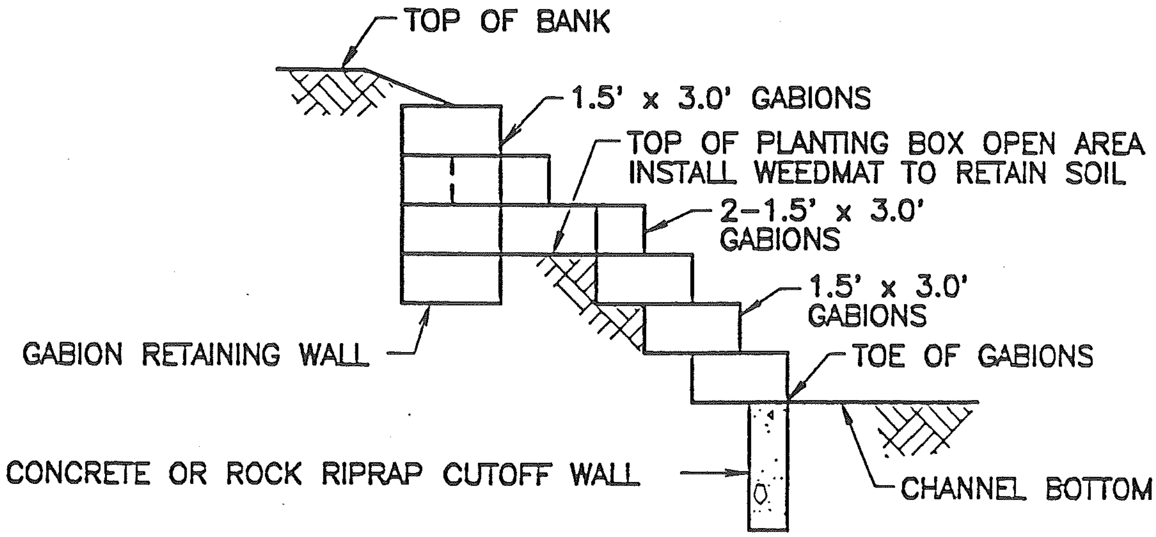

PROPOSED REVEGETATION IN PLANTING BOX (SEE FIGURES 8.13 AND 8.14)
MIN. R/W
Natural Bank
10% Water Surface
VARIES MIN 2:1 OR STABLE SLOPE
LIMIT OF EXCAVATION
3/4:1 MAX.
VOIDS FILLED WITH SOIL
ERODED BANK
BACKFILL
CONCRETE OR ROCK RIPRAP CUTOFF WALL

FIGURE **3.41**
GABIONS



GABION PLANTING BOX SECTION
NTS

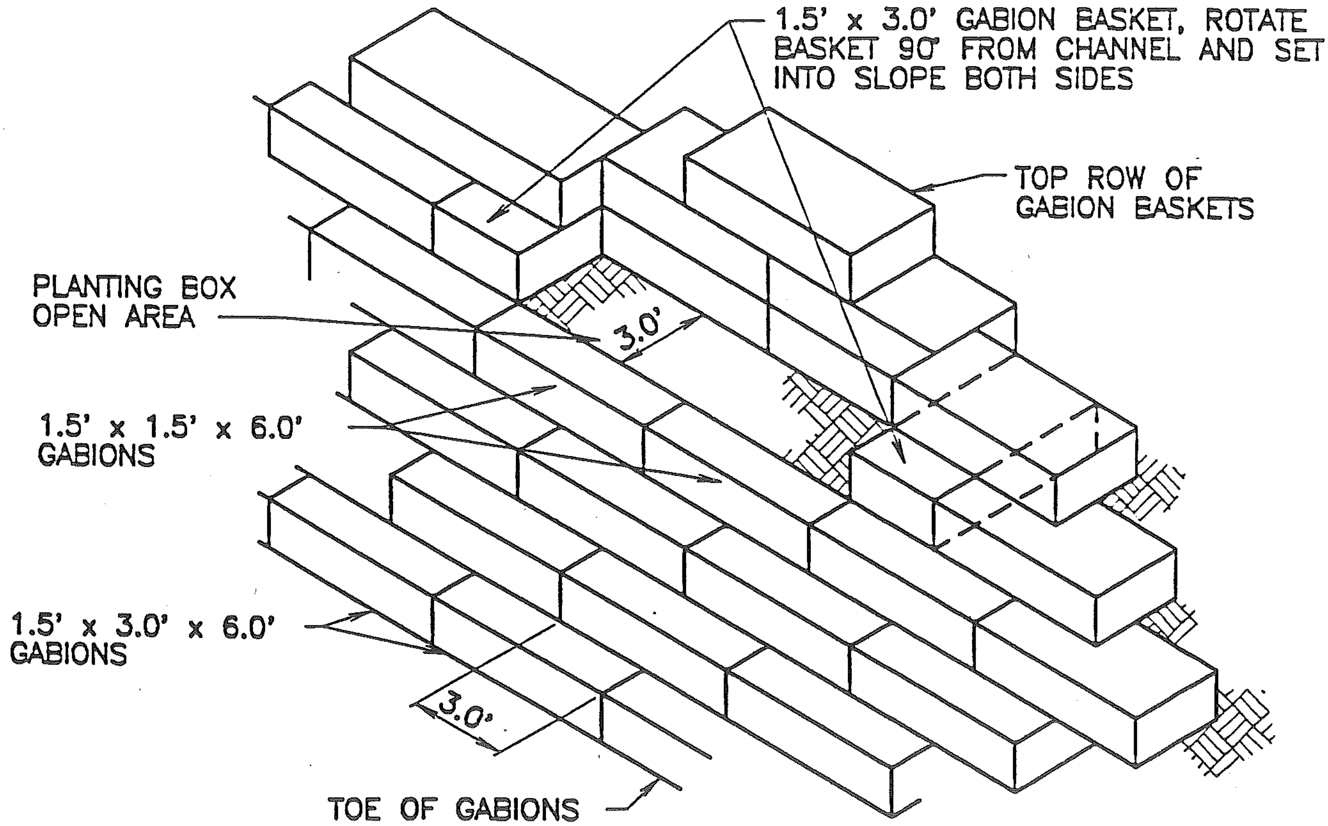


FIGURE 3.42
GABION PLANTING BOX DETAIL
NTS

—Articulated Concrete Mat

ACM consist of concrete interlocking blocks that are cabled together to form mats that can be laid on the channel slope or channel invert (see Figure 3.43). A cutoff wall made of either concrete or ACM is necessary to anchor ACM to the channel. ACM can be open or closed cells. The open cell style has similar benefits to geocell in that moisture migrates through the cells, and herbaceous plants can be revegetated in the cell openings by live stacking or direct seeding (reinforced grass).

Their application is suitable for bank slopes up to 1:1 and flow velocities up to 15 feet per second. The revegetation potential is limited by the size of the cell opening. The closed cell style allows for little migration of water and revegetation but provides stronger support under high flow velocity conditions.

—Cribwalls

Cribwalls consist of stacked interlocking concrete cells that form a retaining wall (see Figure 3.44). The composite design employs the strength of a concrete frame together with compacted backfill. Cribwalls can be vegetated with grasses and herbaceous plants in the openings between the cells by live staking.

Cribwalls can be sloped up to 1/4:1 and can withstand flow velocities up to 15 feet per second. Like articulated concrete block, cribwalls restrict plant growth by the size of the panel opening, and therefore revegetation is limited.

Inert Construction

Inert Construction consists of using only inert materials to protect an eroding channel bank. This type of construction has been widely used in the past due to its predictable properties, ease of installation, availability, and familiarity. These materials have no revegetation potential and will only be applied after both Live Construction and Mixed Construction are deemed not feasible. Therefore, acquisition of right of way will be considered when the cost of mitigation for using this method is high. Methods included in this category include SCSP and gunite.

Sacked Concrete Slope Protection

SCSP consists of burlap bags filled with concrete and placed over filled eroded creek banks (see Figure 3.45). SCSP can be placed at near vertical bank slopes (1/2:1). It requires a concrete or sacked cutoff wall at the toe of the bank. SCSP can withstand flow velocities up to 15 feet per second but does not provide a plantable substrate. However, it can be contoured to avoid trees and create planting wells.

SCSP will only be used where velocities are in excess of 10 feet per second, where there is limited right of way, and where the eroded bank is near vertical.

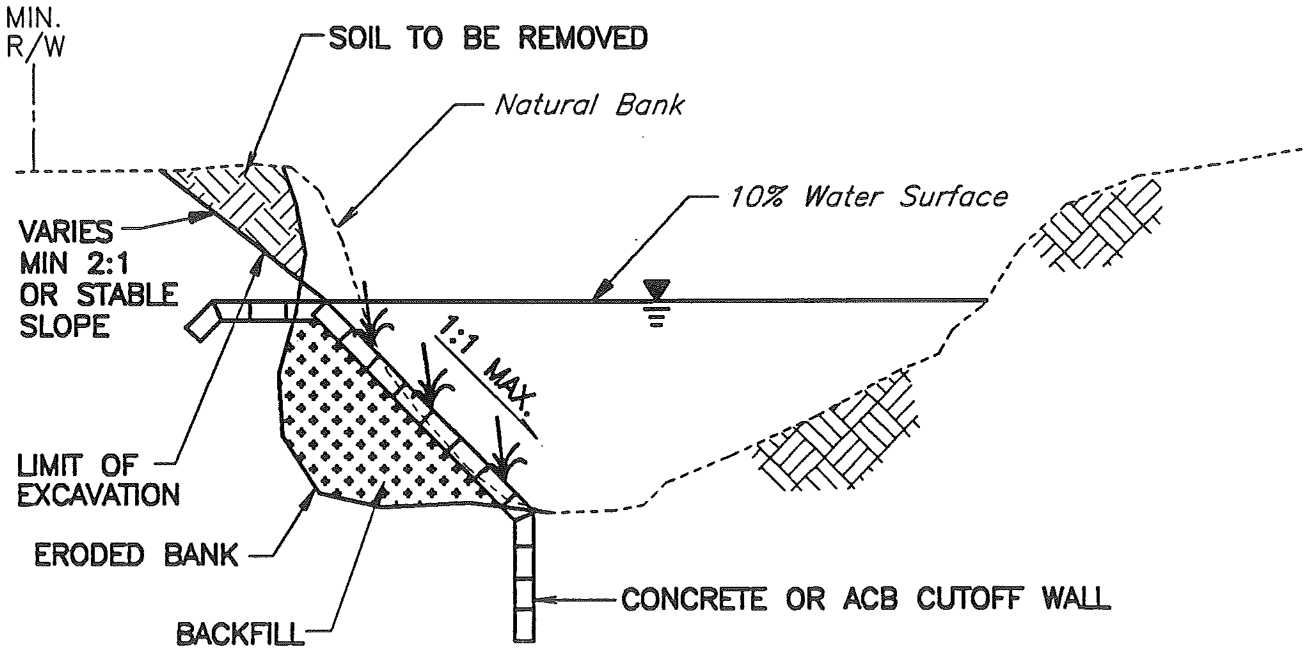


FIGURE **3.43**
ARTICULATED CONCRETE **MAT (ACM)**

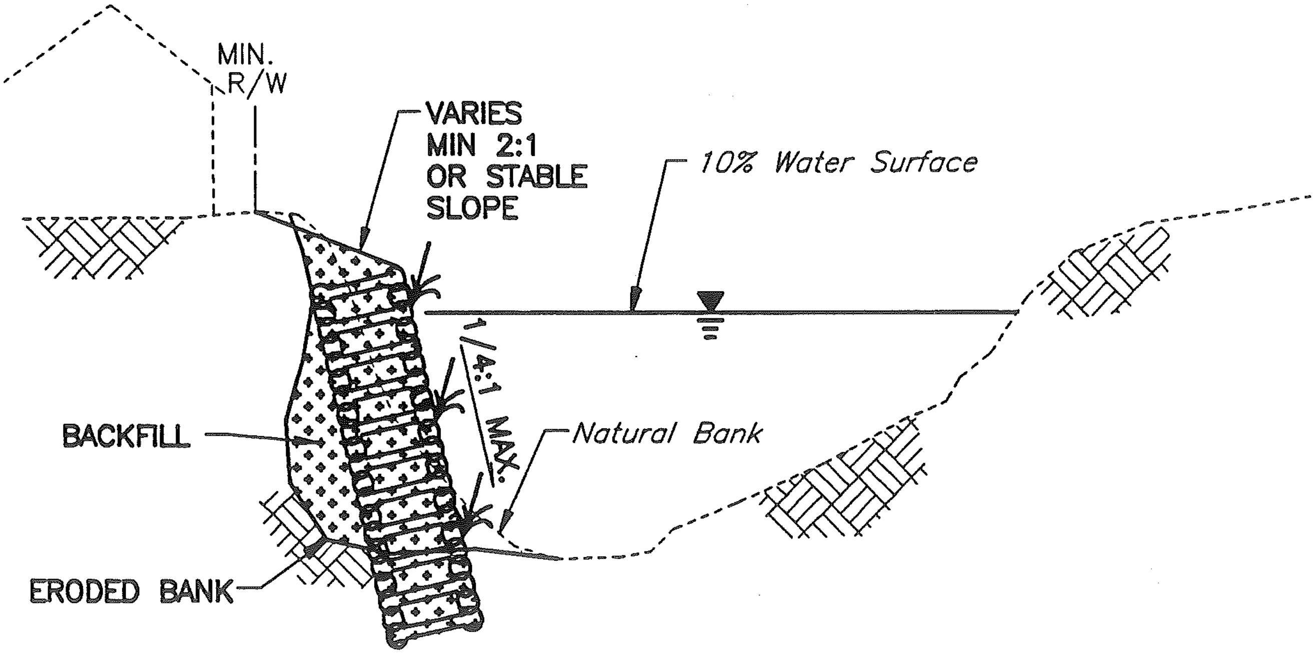


FIGURE **3.44**
CRIBWALLS

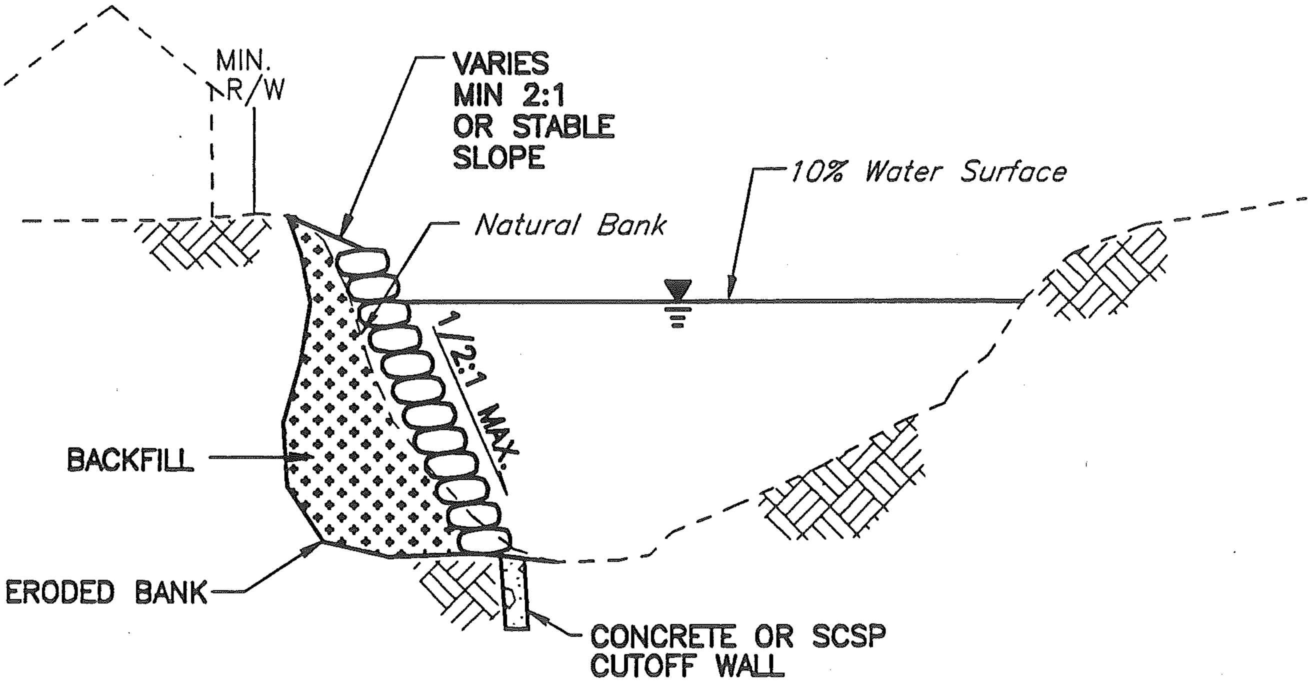


FIGURE **3.45**
SACKED CONCRETE

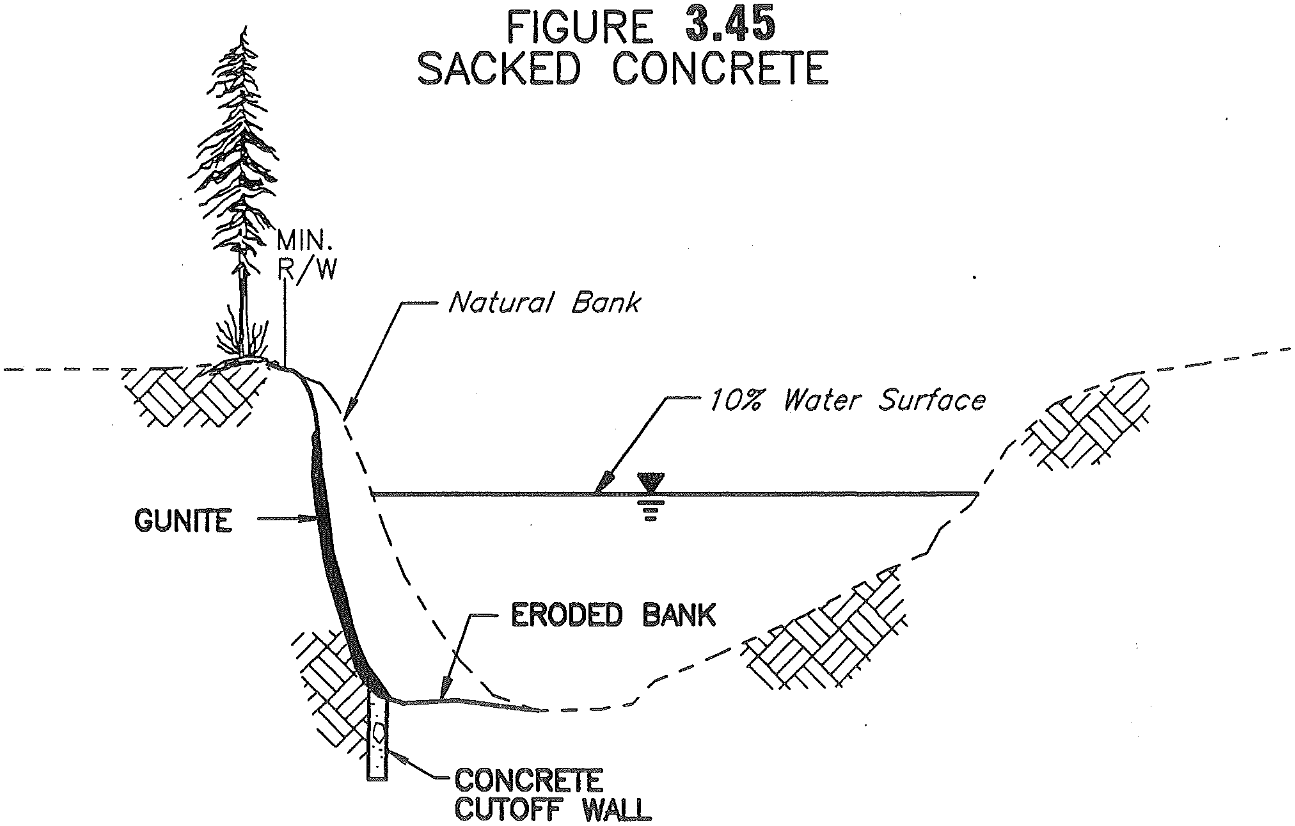


FIGURE **3.46**
GUNITE

Gunite

Gunite is an air blown sand cement mixture placed directly on eroded creek banks (see Figure 3.46). It eliminates plantable substrate but can be contoured to avoid existing trees and create planting wells. This application is suitable for near vertical bank slopes and flow velocities up to 15 feet per second.

Like SCSP, gunite will only be used where there is limited right of way and where the eroded bank is near vertical.

Vortex rock weirs will also be installed as a remedial slope protection measure if channel degradation is causing bank erosion or if channel degradation threatens existing channel structures, existing erosion protection, or adjacent private improvements. Vortex rock weir materials will be rock riprap as described in the Preventative Slope Protection section (see Figures 3.30 and 3.31). Vortex rock weir construction will be considered as an alternative to bank slope protection or employed, were needed, in conjunction with slope protection.

When possible, slope protection will be installed without excavating into the existing eroding bank. Slope protection will match the upstream and downstream channel section by reestablishing the pre-erosion downstream. Proposed slope protection will be placed up to the 10-year flood flow elevation unless it is done as a preventative measure. Slope protection can be placed above the 10-year flood flow elevation if the site conditions or right of way limitation warrant it. An example of this situation would be a house located at the top of the creek bank. The protection height determination would be done on a case-by-case basis by maintenance personnel.

If the desired slope protection method exceeds the space created by the bank erosion, two possible approaches can be applied: (1) excavate into the existing bank, or (2) move the center of the channel further away from the eroding bank.

1. A 2:1 slope will be excavated back from the top of the slope protection where the District has ample right of way and no valuable native vegetation will be impacted (Figure 3.47). This procedure will establish a stable slope above the 10-year flood flow and will allow the District to replant native vegetation on the upper bank.

   A slope will not be excavated from the top of the slope protection where there is either insufficient right of way, structures, or valuable native vegetation would be impacted (Figure 3.48). This approach protects the lower bank from further erosion, but allows the upper bank to find it's own stable condition naturally without disturbing the existing condition.

2. If a point bar has developed in the bank opposite the eroded bank, another alternative could be to excavate the point bar and reestablish a channel alignment that is closer to the opposite bank (Figure 3.49). Available right of way and existing vegetation would need to be evaluated for this approach also.

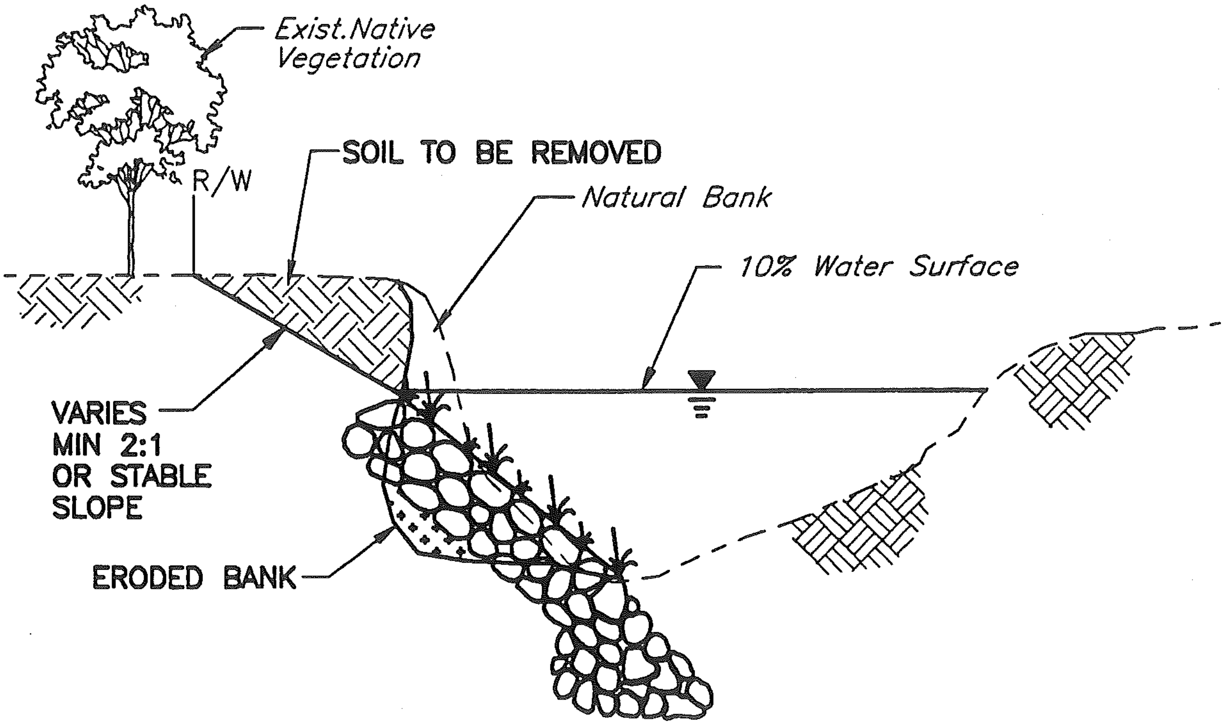


FIGURE 3.47
SLOPE CUTBACK
(ROCK RIPRAP AS EXAMPLE OF REMEDIAL SLOPE PROTECTION)

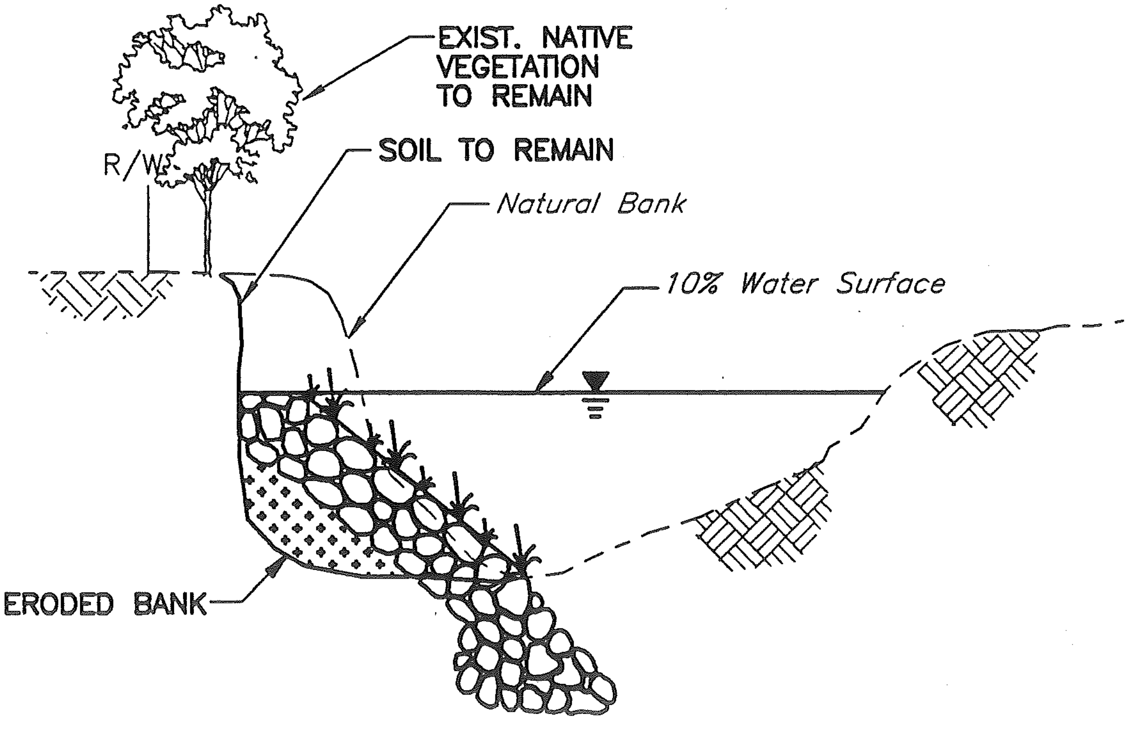


FIGURE 3.48
NO SLOPE CUTBACK
(ROCK RIPRAP AS EXAMPLE OF REMEDIAL SLOPE PROTECTION)

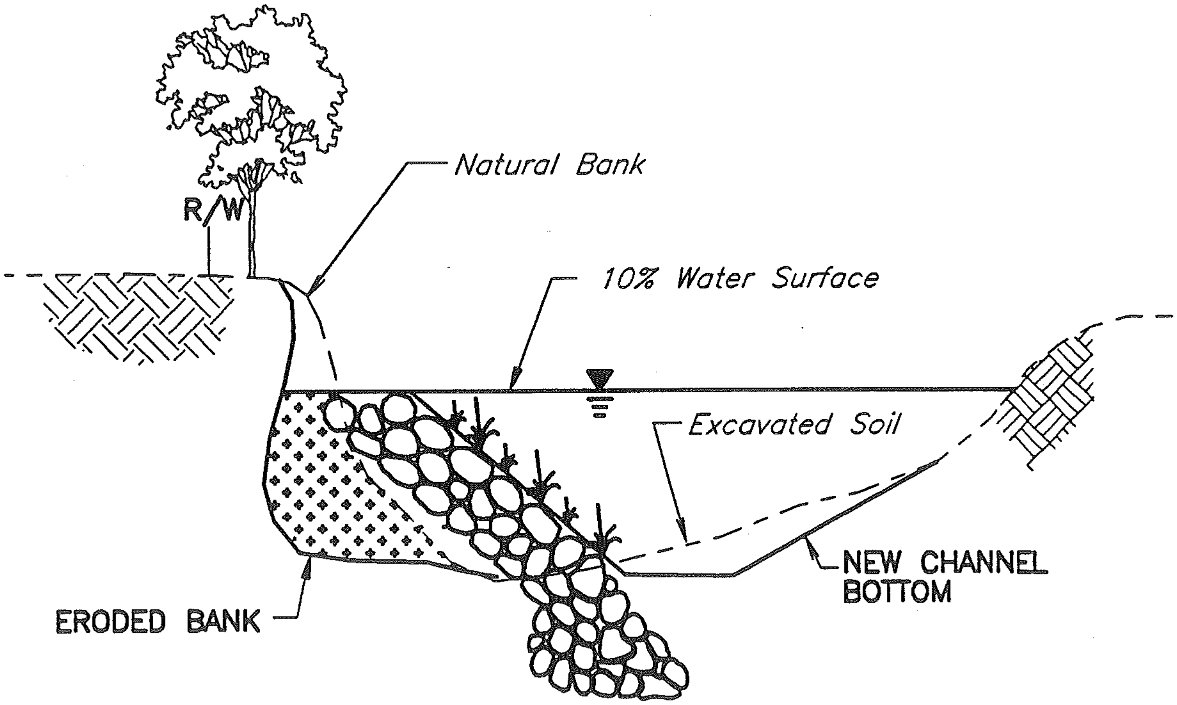


FIGURE 3.49
CHANNEL BOTTOM REALIGNMENT
(ROCK RIPRAP AS EXAMPLE OF REMEDIAL SLOPE PROTECTION)

In any case, the channel bottom will **not** be narrowed beyond the upstream and downstream conditions. Narrowing the channel could cause channel bottom degradation, downstream erosion, and upstream increased water surface. If neither of the two above alternatives can be applied, another slope protection method will be considered.

Bank protection needs to be designed for each specific site. Examples of details that should be designed are (but not limited to): size of rock, thickness of rock, depth and configuration of gabions, depth of gabion cutoff wall, and geocell anchor system.

Erosion protection measures protect for a finite period of time before deteriorating. Therefore, the District will repair existing erosion protection as necessary. If existing erosion protection completely fails, the District will reevaluate the site for alternative methods of protection before reconstruction.

Maintenance Program for Vegetation and Sediment Removal

Reach A: Highway 101—Interstate 880

The maintenance activities on the channel banks would include removal of dead or fallen trees, and control of nonnative habitat using herbicides. No woody vegetation removal is required on the banks. At areas designated for revegetation, the maintenance activities would be hand removal and control of nonnative habitat using herbicides. Removal of woody vegetation and sediment in the channel bottom would be as described in the Maintenance Standards, Table 3.21. Maintenance roads would be sprayed with pre-emergent and post-emergent herbicides annually.

Reaches 6, 7, 8: Interstate 280—Willow Glen Way

The maintenance activities on the natural creek banks would include removal of dead or fallen trees, and control of nonnative habitat using herbicides. No woody vegetation removal is required on the banks. Removal of woody vegetation in the channel bottom would be as described in the Maintenance Standards, Table 3.21.

The maintenance activities in the bypass channel would include repair of damaged gabion baskets, control of nonnative habitat using herbicides, and removal of trash and debris. Removal of woody vegetation and sediment in the channel bottom would be as described in the Maintenance Standards, Table 3.21. Maintenance roads would be sprayed with preemergent and postemergent herbicides annually. At areas designated for revegetation, the maintenance activities would be hand removal and control of nonnative habitat using herbicides.

The confluence and diversion structures in Reaches 6 and 9, respectively, would be inspected annually for damages and repaired as necessary. All trash or debris accumulated at the entrance of the structures would be removed.

Reaches 9 and 10A: Willow Glen Way—Canoas Creek

The maintenance activities on the west bank would consist of removal of dead or fallen trees, and control of nonnative plants using herbicides. Cribwalls on the east bank would be inspected and repaired as necessary. No woody vegetation removal is required on either bank. Removal of sediment and woody vegetation in the channel bottom would be as described in the Maintenance Standards, Table 3.21.

Woody vegetation in the floodway would be removed when the height exceeds 5 feet. The maintenance activities on the revegetation areas would be hand removal and control of nonnative habitat using herbicides. Maintenance road would be sprayed with preemergent and postemergent herbicides annually. The maintenance program for the two short bypasses in Reach 9 would be the same as for Reaches 6, 7, and 8.

Reach 10B: Canoas Creek—Stream Gage 23B

The maintenance activities on the east bank would include removal of dead or fallen trees, and control of nonnative habitat using herbicides. Existing gabion baskets on the west bank would be inspected and repaired as necessary. No woody vegetation removal is required on either bank. Removal of sediment and woody vegetation in the channel bottom would be as described in the Maintenance Standards, Table 3.21.

The levee and maintenance roads would be sprayed with preemergent and postemergent herbicides annually. At areas designated for revegetation, the maintenance activities would be hand removal and control of nonnative habitat using herbicides. Woody vegetation in the floodway would be removed when the height exceeds 10 feet.

Reach 10C: Stream Gage No. 23—Capitol Expressway

From Gage Station 23B to Hillsdale Avenue, the maintenance activities would consist of removal of dead or fallen trees, and control of nonnative habitat using herbicides. No woody vegetation removal is required on the channel banks. Woody growth in the designated floodway would be removed when the height exceeds 5 feet. At areas designated for revegetation, the maintenance activities would be hand removal and control of nonnative habitat using herbicides. The depressed maintenance road would be sprayed with preemergent and postemergent herbicides annually. Upstream of Hillsdale Avenue to Capitol Expressway, the maintenance activities would be control of nonnative habitat using herbicides. Gabion baskets and cribwalls would be inspected and repaired as necessary.

Removal of sediment and woody vegetation in the channel bottom would be as described in the Maintenance Standards, Table 3.21.

Reach 11: Capitol Expressway—Branham Lane

From Capitol Expressway to Branham Lane, the maintenance activities would consist of removal of dead or fallen trees, and control of nonnative habitat using herbicides. No woody vegetation removal is required on the channel banks. Gabion baskets and cribwalls would be inspected and repaired as necessary. The maintenance program for the 700-foot long bypass in this reach would be the same as for Reaches 6, 7, and 8. From 1,500 feet upstream of Capitol Expressway to the SJWC property, the maintenance activities on the east bank would be control of nonnative habitat using herbicides. At areas designated for revegetation, the maintenance activities would be hand removal and control of nonnative habitat using herbicides. Maintenance roads would be sprayed with preemergent and postemergent herbicides annually. Removal of sediment and woody vegetation in the channel bottom would be as described in the Maintenance Standards, in Table 3.21.

Reach 12: Branham Lane—Blossom Hill Road

The maintenance activities would consist of removal of dead or fallen trees, and control of nonnative habitat using herbicides. No woody vegetation removal is required on the channel banks. Removal of sediment and woody vegetation in the channel bottom would be as described in the Maintenance Standards, Table 3.21. At areas designated for revegetation, the maintenance activities would be hand removal and control of nonnative habitat using herbicides. Maintenance roads and levees would be sprayed with preemergent and postemergent herbicides annually.

Canoas Creek: Guadalupe River—End of Nightingale Drive

The maintenance activities would consist of trash and debris removal, and control of woody vegetation using herbicides. Removal of sediment in the channel bottom would be as described in the Maintenance Standards, Table 3.21. Box culverts under Almaden Expressway and Nightingale Drive would be inspected and any sediment accumulation would be removed as necessary. The maintenance road would be sprayed with preemergent and postemergent herbicides annually. Any vegetation overhanging into the maintenance road from adjacent properties would be pruned.

Ross Creek: Guadalupe River—Jarvis Avenue

The maintenance activities would consist of trash and debris removal, and control of woody vegetation. Removal of sediment in the channel bottom would be as described in the Maintenance Standards, Table 3.21. Box culverts under Almaden Expressway, Cherry Avenue and Jarvis Avenue would be inspected and any sediment accumulation would be removed when exceeding acceptable maintenance limit. ACM lining would also be inspected and repaired as necessary. Maintenance road would be sprayed with preemergent and postemergent herbicides annually. Any vegetation overhanging into the maintenance road from the adjacent properties would be pruned.

Maintenance Standards

The flow area of the proposed flood control channel would require periodic clearing. Maximum levels of vegetation and sediment which can be allowed within the flow area without jeopardizing the 100-year flood flow capacity have been identified during the hydraulic design. These maximum levels are called acceptable maintenance limits and are listed in Table 3.21 and shown in Figures 3.50 to 3.81. The estimated annual maintenance costs, based on these maintenance limits/standards, are summarized in Table 3.22.

TABLE 3.21
Maintenance Standards for Sediment and Vegetation Removal
Guadalupe River—Highway 101 to I-880 and I-280 to Blossom Hill Road

Reach A: Highway 101 to I-880

	Facility Type	Maintenance Issue	Acceptable Maintenance Limit	Performance Criteria
Existing Excavated Channel	Channel Invert	Uniform Sediment (Highway 101 to Future Skyport Drive)	Sediment 4′ below depressed maintenance road on east bank, i.e., 3′ sediment depth	Remove sediment from toe to toe.
		Uniform Sediment (Future Skyport Drive to I-880)	Sediment 9′ below depressed revegetation bench, i.e., 1′ sediment depth	Remove sediment from toe to toe.
		Local Sediment (bars, sloughs, etc.)	No limit	No maintenance required.
		Woody Vegetation (Willows, Cottonwoods, Bamboo, etc.)	Height of tallest vegetation outside a 50′ wide corridor exceeds 10′. No woody vegetation within the 50′ corridor.	In conjunction with herbicide program, remove or cut vegetation outside of the 25′ corridor to height of 1′ or less and chemical treatment of large stumps (except existing standing trees with trunk diameter greater than 6″ shall remain).
		Flexible Vegetation (brush, vines, etc.)	Vegetation occupies entire invert	After herbicides treatment, remove all brush from toe to toe.
	East and West Banks	Vegetation	Control of nonnative species	Hand removal and control of nonnative species with herbicides. Dead or fallen trees, and trash would be removed.
	Revegetation Areas	Vegetation	Control of nonnative species	Hand removal and control of nonnative species with herbicides. Dead or fallen trees, and trash would be removed.
	Maintenance Roads and Ramps	Vegetation on Roads	No vegetation on roads	Spray preemergent and postemergent herbicides.
		Vegetation Overhanging	Vegetation overhanging into roadway	Cut back overhanging vegetation to edge of maintenance road up to the height of 12′.

TABLE 3.21
Maintenance Standards for Sediment and Vegetation Removal
Guadalupe River—Highway 101 to I-880 and I-280 to Blossom Hill Road
(continued)

Reaches 6, 7, and 8: I-280 to Willow Glen Way

	Facility Type	Maintenance Issue	Acceptable Maintenance Limit	Performance Criteria
Existing Natural Channel	Channel Invert	Woody Vegetation (Willows, Cottonwoods, bamboo, etc.)	Height of tallest vegetation outside a 25′ wide corridor exceeds 10′. No woody vegetation within the 25′ corridor.	In conjunction with herbicides program, remove or cut vegetation outside of the 25′ wide corridor to height of 1′ or less and chemical treatment of larger stumps.
		Flexible Vegetation (brush, vines, etc.)	Vegetation occupies **entire** invert	After herbicides treatment, remove all brush from 25′ wide corridor.
	East and West Banks	Vegetation	Control of nonnative species	Hand removal and control of nonnative species with herbicides. Dead or fallen trees, and trash would be removed.
Gabion Bypass Channel	Channel Invert	Streambed Scour	Expose 2′ of cutoff wall	Place rock, restore bed.
		Uniform Sediment	Sediment above first gabion course (1.5′)	Remove sediment.
		Local Sediment (bars, sloughs, etc.)	Sediment above second gabion course (3.0′)	Remove sediment.
		Woody Vegetation (Willows, Cottonwoods, Bamboo, etc.)	Height of tallest vegetation exceeds 10′	In conjunction with herbicides program, remove or cut vegetation on invert to height of 1′ or less and chemical treatment of large stumps.
		Flexible Vegetation (brush, vines, etc.)	Vegetation occupies **entire** invert	After herbicides treatment, remove all brush from toe to toe.
	East and West Banks	Vegetation	Control of nonnative species	Control of nonnative species with herbicides and hand removal. Dead or fallen trees, and trash would be removed.
	Revegetation Areas	Vegetation	Control of nonnative species	Hand removal and control of nonnative species with herbicides. Dead or fallen trees, and trash would be removed.
	Maintenance Roads and Ramps	Vegetation on Roads	No vegetation on roads	Spray preemergent and postemergent herbicides.
		Vegetation Overhanging	Vegetation overhanging into roadway	Cut back overhanging vegetation to edge of maintenance road up to the height of 12′.

TABLE 3.21
Maintenance Standards for Sediment and Vegetation Removal Guadalupe River—Highway 101 to I-880 and I-280 to Blossom Hill Road
(continued)

Reaches 9 and 10A : Willow Glen Way to Almaden Expressway (Southbound)

	Facility Type	Maintenance Issue	Acceptable Maintenance Limit	Performance Criteria
Widened Cribwall Channel	Channel Invert	Uniform Sediment (Willow Glen Way to Willow Glen Way Island)	Sediment 6′ below depressed maintenance road on east bank, i.e., 3′ sediment depth	Remove sediment from 25′ wide corridor.
		Uniform Sediment (Upstream of Willow Glen Way Island to Malone Road)	Sediment 3′ below depressed maintenance road , i.e., 3′ sediment depth	Remove sediment from 25′ wide corridor.
		Uniform Sediment (Malone Road to Malone Road Island)	Sediment 2′ below depressed maintenance road on east bank, i.e., 3′ sediment depth	Remove sediment from 25′ wide corridor.
		Uniform Sediment (Upstream of Malone Road Island to Almaden Expressway Southbound)	Sediment 2′ below depressed maintenance road on east bank, i.e., 3′ sediment depth	Remove sediment from 25′ wide corridor.
		Local Sediment (bars, sloughs,etc.)	No limit	No maintenance required.
		Woody Vegetation (Willows, Cottonwoods, bamboo, etc.)	Height of tallest vegetation outside a 25′ wide corridor exceeds 10′. No woody vegetation within the 25′ corridor.	In conjunction with herbicides program, remove or cut vegetation outside of the 25′ wide corridor on invert to height of 1′ or less and chemical treatment of large stumps.
		Flexible Vegetation (brush, vines, etc.)	Vegetation occupies **entire** invert	After herbicides treatment, remove all brush from 25′ wide corridor.
	Floodway	Local Scour	Expose 2′ of cutoff wall	Place rock, restore bed.
		Woody Vegetation (Willows, Cottonwoods, etc.)	Height of tallest vegetation exceeds 5′	In conjunction with herbicides program, remove or cut vegetation on floodway to height of 1′ or less and chemical treatment of large stumps.
		Flexible Vegetation (brush, vines, etc.)	Vegetation occupies **entire** floodway	After herbicides treatment, remove all brush on floodway.
	East and West Banks	Vegetation	Control of nonnative species	Hand removal and control of nonnative species with herbicides. Dead or fallen trees, and trash would be removed.
	Depressed Maintenance Road and Ramps	Vegetation on Road	No vegetation on road	Spray preemergent and postemergent herbicides.
		Vegetation Overhanging	Vegetation overhanging into roadway	Cut back overhanging vegetation to edge of maintenance road up to the height of 12′.

TABLE 3.21
Maintenance Standards for Sediment and Vegetation Removal
Guadalupe River—Highway 101 to I-880 and I-280 to Blossom Hill Road
(continued)

	Facility Type	Maintenance Issue	Acceptable Maintenance Limit	Performance Criteria
Gabion Bypass Channels (Upstream of Willow Glen Way and Malone Road)	Channel Invert	Streambed Scour Woody Vegetation (Willows, Cottonwoods, etc.) Flexible Vegetation (brush, vines, etc.)	Expose 2′ of cutoff wall Height of tallest vegetation exceeds 10′ Vegetation occupies entire invert	Place rock, restore bed. In conjunction with herbicides program, remove or cut vegetation on invert to height of 1′ or less and chemical treatment of large stumps. After herbicides treatment, remove all brush on invert.
	East and West Banks	Vegetation	Control of nonnative species	Hand removal and control of nonnative species with herbicides. Dead or fallen trees, and trash would be removed.
	Revegetation Areas	Vegetation	Control of nonnative species	Hand removal and control of nonnative species with herbicides. Dead or fallen trees, and trash would be removed.
Undisturbed Natural Channels (Upstream of Willow Glen Way and Malone Road)	Channel Invert	Woody Vegetation (Willows, Cottonwoods, bamboo, etc.) Flexible Vegetation (brush, vines, etc.)	Height of tallest vegetation within a 25′ wide designated corridor exceeds 10′ Vegetation occupies entire invert	In conjunction with herbicides program, remove or cut a 25′ wide corridor through vegetation on invert to height of 1′ or less and chemical treatment of large stumps. After herbicides treatment, remove all brush from 25′ wide corridor.
	East and West Banks	Vegetation	Control of nonnative species	Hand removal and control of nonnative species with herbicides. Dead or fallen trees, and trash would be removed.

TABLE 3.21
Maintenance Standards for Sediment and Vegetation Removal
Guadalupe River—Highway 101 to I-880 and I-280 to Blossom Hill Road
(continued)

Reach 10B: Almaden Expressway (Southbound) to Gage Station 23B

	Facility Type	Maintenance Issue	Acceptable Maintenance Limit	Performance Criteria
Existing Gabion Lined Channel	Channel Invert	Streambed Scour	Expose 2′ of cutoff wall	Place rock, restore bed.
		Uniform Sediment (Almaden Expressway Southbound to Northbound)	Sediment above first gabion course (1.5′)	Remove sediment from invert.
		Uniform Sediment (Almaden Expressway Northbound to Gage Station 23B)	No limit	No maintenance required.
		Local Sediment (bars, sloughs, etc.)	No limit	No maintenance required.
		Woody Vegetation (Willows, Cottonwoods, bamboo, etc.)—Almaden Expressway Southbound to Northbound	Height of tallest vegetation outside a 25′ wide corridor exceeds 10′. No woody vegetation within the 25′ corridor.	In conjunction with herbicides program, remove or cut vegetation outside the 25′ wide corridor on invert to height of 1′ or less and chemical treatment of large stumps.
		Woody Vegetation (Willows, Cottonwoods, bamboo, etc.)—Almaden Expressway Northbound to Gage Station 23B	Control of nonnative species	Hand removal and control of nonnative species with herbicides. Dead or fallen trees, and trash would be removed.
		Flexible Vegetation (brush, vines, etc.)—Almaden Expressway Southbound to Northbound	Vegetation occupies **entire** invert	After herbicides treatment, remove all brush from 25′ wide corridor.
		Flexible Vegetation (brush, vines, etc.)—Almaden Expressway Northbound to Gage Station 23B	Control of nonnative species	Hand removal and control of nonnative species with herbicides. Dead or fallen trees, and trash would be removed.
	Floodway	Woody Vegetation (Willows, Cottonwoods, etc.)	Height of tallest vegetation exceeds 5′	In conjunction with herbicides program, remove or cut vegetation on floodway to height of 1′ or less and chemical treatment of large stumps.
		Flexible Vegetation (brush, vines, etc.)	Vegetation occupies **entire** floodway	After herbicides treatment, remove all brush on floodway.
	East and West Banks	Vegetation	Control of nonnative species	Hand removal and control of nonnative species with herbicides. Dead or fallen trees, and trash would be removed.
	Revegetation Areas	Vegetation	Control of nonnative species	Hand removal and control of nonnative species with herbicides. Dead or fallen trees, and trash would be removed.
	Depressed Maintenance Road, Ramps and Road on Levee	Vegetation on Road	No vegetation on road	Sprayed preemergent and postemergent herbicides.
		Vegetation Overhanging	Vegetation overhanging into roadway	Cut back overhanging vegetation to edge of maintenance road up to the height of 12′.

TABLE 3.21
Maintenance Standards for Sediment and Vegetation Removal
Guadalupe River—Highway 101 to I-880 and I-280 to Blossom Hill Road
(continued)

Reach 10C: Gage Station 23B to Capitol Expressway

	Facility Type	Maintenance Issue	Acceptable Maintenance Limit	Performance Criteria
Widened Gabion Channel	Channel Invert	Woody Vegetation (Willows, Cottonwoods, bamboo, etc.)	Height of tallest vegetation outside a 25′ wide corridor exceeds 10′. No woody vegetation within the 25′corridor.	In conjunction with herbicides program, remove or cut vegetation outside of 25′ wide corridor on invert to height of 1′ or less and chemical treatment of large stumps.
		Flexible Vegetation (brush, vines, etc.)	Vegetation occupies **entire** invert	After herbicides treatment, remove all brush from 25′ wide corridor.
	Floodway	Local Scour	Expose 2′ of cutoff wall	Place rock, restore bed.
		Woody Vegetation (Willows, Cottonwoods, etc.)	Height of tallest vegetation exceeds 5′	In conjunction with herbicides program, remove or cut vegetation on floodway to height of 1′ or less and chemical treatment of large stumps.
		Flexible Vegetation (brush, vines, etc.)	Vegetation occupies **entire** floodway	After herbicides treatment, remove all brush on floodway.
	East and West Banks	Vegetation	Control of nonnative species	Hand removal and control of nonnative species with herbicides. Dead or fallen trees, and trash would be removed.
	Revegetation Areas	Vegetation	Control of nonnative species	Hand removal and control of nonnative species with herbicides. Dead or fallen trees, and trash would be removed.
	Depressed Maintenance Road and Ramps	Vegetation on Road	No vegetation on road	Spray preemergent and postemergent herbicides.
		Vegetation Overhanging	Vegetation overhanging into roadway	Cut back overhanging vegetation to edge of maintenance road up to the height of 12′.

TABLE 3.21
Maintenance Standards for Sediment and Vegetation Removal
Guadalupe River—Highway 101 to I-880 and I-280 to Blossom Hill Road
(continued)

Reach 11: Capitol Expressway to Branham Lane

	Facility Type	Maintenance Issue	Acceptable Maintenance Limit	Performance Criteria
Widened Gabion Channel	Channel Invert	Streambed Scour	Expose 2′ of cutoff wall	Place rock, restore bed.
		Uniform Sediment (Capitol Expressway to San Jose Water Co. property)	Sediment above second gabion course (3.0′)	Remove sediment from 25′ wide corridor.
		Uniform Sediment (San Jose Water Co. property to Ross Creek confluence)	Sediment at same elevation as depressed revegetation bench on west bank, i.e., 3′ sediment depth	Remove sediment from 25′ wide corridor.
		Uniform Sediment (Ross Creek confluence to Branham Lane)	Sediment 3′ below depressed maintenance road on west bank, i.e., 3′ sediment depth	Remove sediment from 25′ wide corridor.
		Local Sediment (bars, sloughs, etc.)	No limit	No maintenance required.
		Woody Vegetation (willows, Cottonwoods, bamboo, etc.)	Height of tallest vegetation outside a 25′ wide corridor exceeds 10′. No woody vegetation within the 25′ corridor.	In conjunction with herbicides program, remove or cut vegetation outside of the 25′ wide corridor on invert to height of 1′ or less and chemical treatment of large stumps.
		Flexible Vegetation (brush, vines, etc.)	Vegetation occupies **entire** invert	After herbicides treatment, remove all brush from 25′ wide corridor.
	Floodway (Ross Creek Confluence to Branham Lane)	Woody Vegetation (Willows, Cottonwoods, etc.)	Height of tallest vegetation exceeds 5′	In conjunction with herbicides program, remove or cut vegetation on floodway to height of 1′ or less and chemical treatment of large stumps.
		Flexible Vegetation (brush, vines, etc.)	Vegetation occupies **entire** floodway	After herbicides treatment, remove all brush on floodway.
	East and West Banks	Vegetation	Control of nonnative species	Hand removal and control of nonnative species with herbicides. Dead or fallen trees, and trash would be removed.

TABLE 3.21
Maintenance Standards for Sediment and Vegetation Removal
Guadalupe River—Highway 101 to I-880 and I-280 to Blossom Hill Road
(continued)

	Facility Type	Maintenance Issue	Acceptable Maintenance Limit	Performance Criteria
	Revegetation Areas	Vegetation	Control of nonnative species	Hand removal and control of nonnative species with herbicides. Dead or fallen trees, and trash would be removed.
	Depressed Maintenance Roads and Ramps	Vegetation on Roads	No vegetation on roads	Sprayed preemergent and postemergent herbicides.
		Vegetation Overhanging	Vegetation overhanging into roadway	Cut back overhanging vegetation to edge of maintenance road up to the height of 12′.
Gabion Bypass Channel (Upstream of Capitol Expressway)	Channel Invert	Streambed Scour	Expose 2′ of cutoff wall	Place rock, restore bed.
		Woody Vegetation (Willows, Cottonwoods, etc.)	Height of tallest vegetation exceeds 10′	In conjunction with herbicides program, remove or cut vegetation on invert to height of 1′ or less and chemical treatment of large stumps.
		Flexible Vegetation (brush, vines, etc.)	Vegetation occupies entire invert	After herbicides treatment, remove all brush on invert.
	East and West Banks	Vegetation	Control of nonnative species	Hand removal and control of nonnative species with herbicides. Dead or fallen trees, and trash would be removed.
	Revegetation Areas	Vegetation	Control of nonnative species	Hand removal and control of nonnative species with herbicides. Dead or fallen trees, and trash would be removed.

TABLE 3.21
Maintenance Standards for Sediment and Vegetation Removal
Guadalupe River—Highway 101 to I-880 and I-280 to Blossom Hill Road
(continued)

Reach 12: Branham Lane to Blossom Hill Road

	Facility Type	Maintenance Issue	Acceptable Maintenance Limit	Performance Criteria
Existing Natural Channel	Channel Invert	Uniform Sediment—Branham Lane to Branham Lane Dam	Sediment 4′ below depressed maintenance road on east bank, i.e., 3′ sediment depth	Remove sediment from invert.
		Uniform Sediment—Branham Lane Dam to Chynoweth Avenue	Sediment 9′ below depressed maintenance road on east bank, i.e., 3′ sediment depth	Remove sediment from invert.
		Uniform Sediment—Chynoweth Avenue to Blossom Hill Dam	Sediment 4′ below depressed maintenance road on east bank, i.e., 3′ sediment depth	Remove sediment from invert.
		Uniform Sediment—Blossom Hill Dam to Blossom Hill Road	Sediment 12′ below depressed maintenance road on east bank, i.e., 3′ sediment depth	Remove sediment from invert.
		Local Sediment (bars, sloughs, etc.)	No limit	No maintenance required.
		Woody Vegetation (Willows, Cottonwoods, etc.)	Height of tallest vegetation outside a 25′ wide corridor exceeds 10′. No woody vegetation within the 25′ corridor.	In conjunction with herbicides program, remove or cut vegetation outside of the 25′ wide corridor on invert to height of 1′ or less and chemical treatment of large stumps.
		Flexible Vegetation (brush, vines, etc.)	Vegetation occupies entire invert	After herbicides treatment, remove all brush from 25′ wide corridor.
	East and West Banks	Vegetation	Control of nonnative species	Hand removal and control of nonnative species with herbicides. Dead or fallen trees, and trash would be removed.
	Revegetation Areas	Vegetation	Control of nonnative species	Hand removal and control of nonnative species with herbicides. Dead or fallen trees, and trash would be removed.
	Maintenance Roads and Ramps	Vegetation on Roads	No vegetation on roads	Spray preemergent and postemergent herbicides.
		Vegetation Overhanging	Vegetation overhanging into roadway	Cut back overhanging vegetation to edge of maintenance road up to the height of 12′.

TABLE 3.21
Maintenance Standards for Sediment and Vegetation Removal
Guadalupe River—Highway 101 to I-880 and I-280 to Blossom Hill Road
(continued)

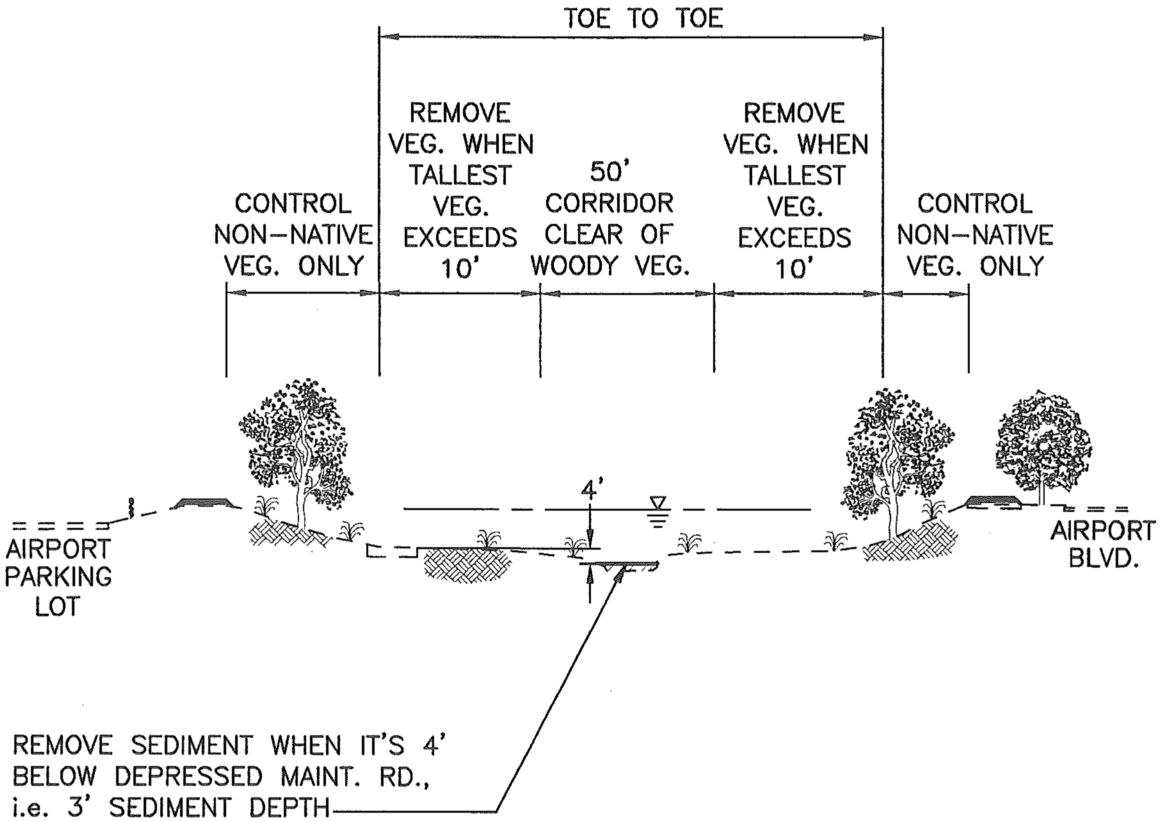
Canoas Creek: Almaden Expressway to End of Nightingale Drive

	Facility Type	Maintenance Issue	Acceptable Maintenance Limit	Performance Criteria
Floodwalls	Channel Invert	Uniform Sediment	Sediment 1′ above invert	Remove sediment from invert.
		Local Sediment (bars, sloughs, etc.)	No limit	No maintenance required.
		Woody Vegetation	Height of tallest vegetation exceeds 5′	In conjunction with herbicides program, remove or cut vegetation on invert to height of 1′ or less and chemical treatment of large stumps.
		Brush, Vines, etc.	Vegetation occupies entire invert	After herbicides treatment, remove all brush from toe to toe.
	East and West Banks	Woody Vegetation	Height of tallest vegetation exceeds 5′	In conjunction with herbicides program, remove or cut vegetation on banks to height of 1′ or less and chemical treatment of large stumps.
		Brush, Vines, etc.	Vegetation occupies entire banks	After herbicides treatment, remove all brush on banks.
	Maintenance Road and Ramps	Vegetation on Road	No vegetation on road	Sprayed preemergent and postemergent herbicides.
		Vegetation Overhanging	Vegetation overhanging into roadway	Cut back overhanging vegetation to edge of maintenance road up to the height of 12′.

TABLE 3.21
Maintenance Standards for Sediment and Vegetation Removal
Guadalupe River—Highway 101 to I-880 and I-280 to Blossom Hill Road
(continued)

Ross Creek: Almaden Expressway to Cherry Avenue

	Facility Type	Maintenance Issue	Acceptable Maintenance Limit	Performance Criteria
Armorflex Lined Channel	Channel Invert	Uniform Sediment	Sediment 1′ above invert	Remove sediment from invert.
		Local Sediment (bars, sloughs, etc.)	No limit	No maintenance required.
		Woody Vegetation	Height of tallest vegetation exceeds 5′	In conjunction with herbicides program, remove or cut vegetation on invert to height of 1′ or less and chemical treatment of large stumps.
		Brush, Vines, etc.	Vegetation occupies entire invert	After herbicides treatment, remove all brush from toe to toe.
	East and West Banks	Woody Vegetation	Height of tallest vegetation exceeds 5′	In conjunction with herbicides program, remove or cut vegetation on banks to height of 1′ or less and chemical treatment of large stumps.
		Brush, Vines, etc.	Vegetation occupies entire banks	After herbicides treatment, remove all brush on banks.
	Maintenance Road and Ramps	Vegetation on Road	No vegetation on road	Sprayed preemergent and postemergent herbicides.
		Vegetation Overhanging	Vegetation overhanging into roadway	Cut back overhanging vegetation to edge of maintenance road up to the height of 12′.

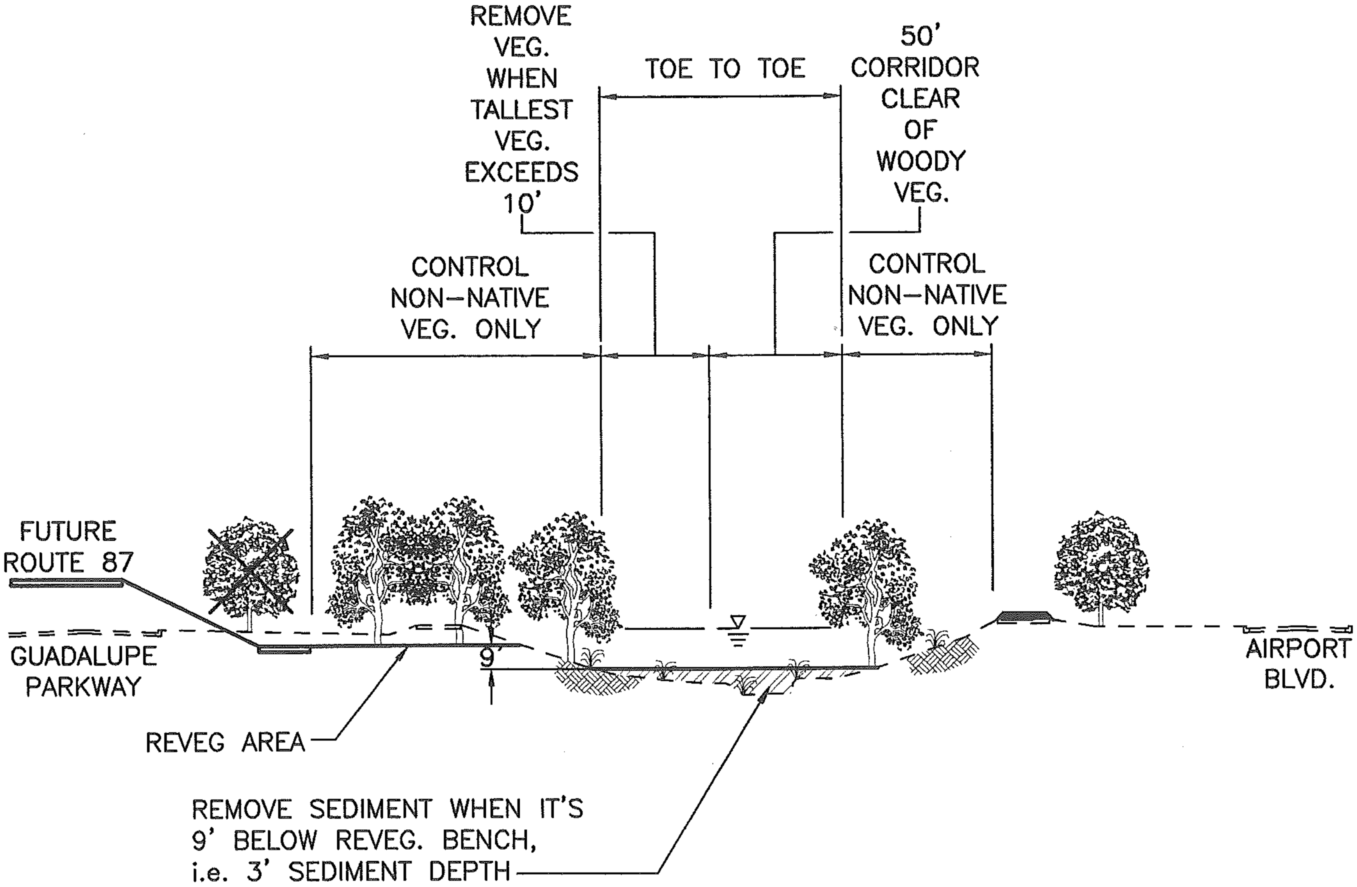

TOE TO TOE
CONTROL NON-NATIVE VEG. ONLY
REMOVE VEG. WHEN TALLEST VEG. EXCEEDS 10'
50' CORRIDOR CLEAR OF WOODY VEG.
REMOVE VEG. WHEN TALLEST VEG. EXCEEDS 10'
CONTROL NON-NATIVE VEG. ONLY
4'
AIRPORT PARKING LOT
AIRPORT BLVD.
REMOVE SEDIMENT WHEN IT'S 4' BELOW DEPRESSED MAINT. RD., i.e. 3' SEDIMENT DEPTH

TYPICAL SECTION

STA. 481+00± TO STA. 502+00±

NTS

FIGURE 3.50
MAINTENANCE PROGRAM (REACH A)

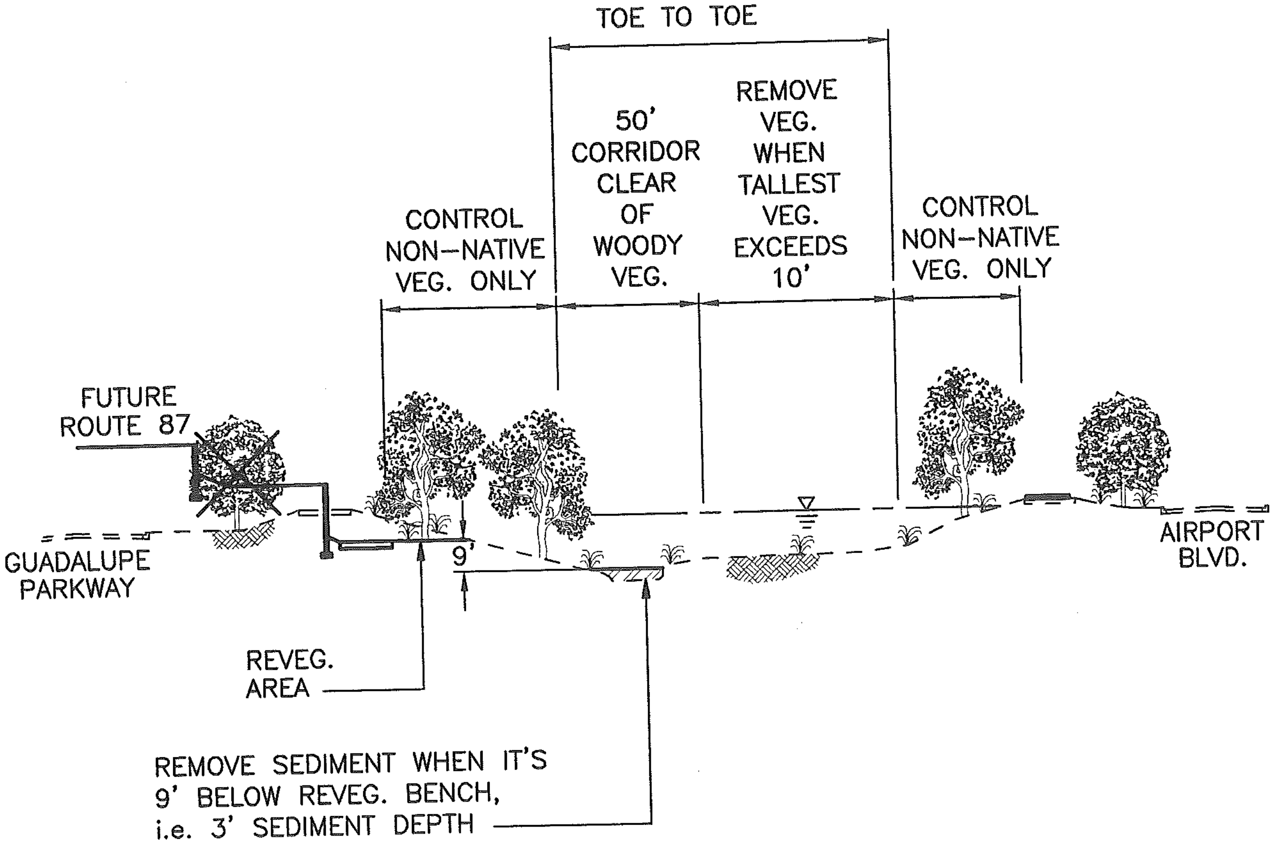

REMOVE VEG. WHEN TALLEST VEG. EXCEEDS 10'
TOE TO TOE
50' CORRIDOR CLEAR OF WOODY VEG.
CONTROL NON-NATIVE VEG. ONLY
CONTROL NON-NATIVE VEG. ONLY
FUTURE ROUTE 87
GUADALUPE PARKWAY
9'
AIRPORT BLVD.
REVEG AREA
REMOVE SEDIMENT WHEN IT'S 9' BELOW REVEG. BENCH, i.e. 3' SEDIMENT DEPTH

TYPICAL SECTION

STA. 518+50± TO STA. 523+00±

NTS

FIGURE 3.51
MAINTENANCE PROGRAM (REACH A)


TOE TO TOE
CONTROL NON-NATIVE VEG. ONLY
50' CORRIDOR CLEAR OF WOODY VEG.
REMOVE VEG. WHEN TALLEST VEG. EXCEEDS 10'
CONTROL NON-NATIVE VEG. ONLY
FUTURE ROUTE 87
GUADALUPE PARKWAY
9'
AIRPORT BLVD.
REVEG. AREA
REMOVE SEDIMENT WHEN IT'S 9' BELOW REVEG. BENCH, i.e. 3' SEDIMENT DEPTH

TYPICAL SECTION

STA. 523+00± TO STA. 528+00±

NTS

FIGURE 3.52
MAINTENANCE PROGRAM (REACH A)

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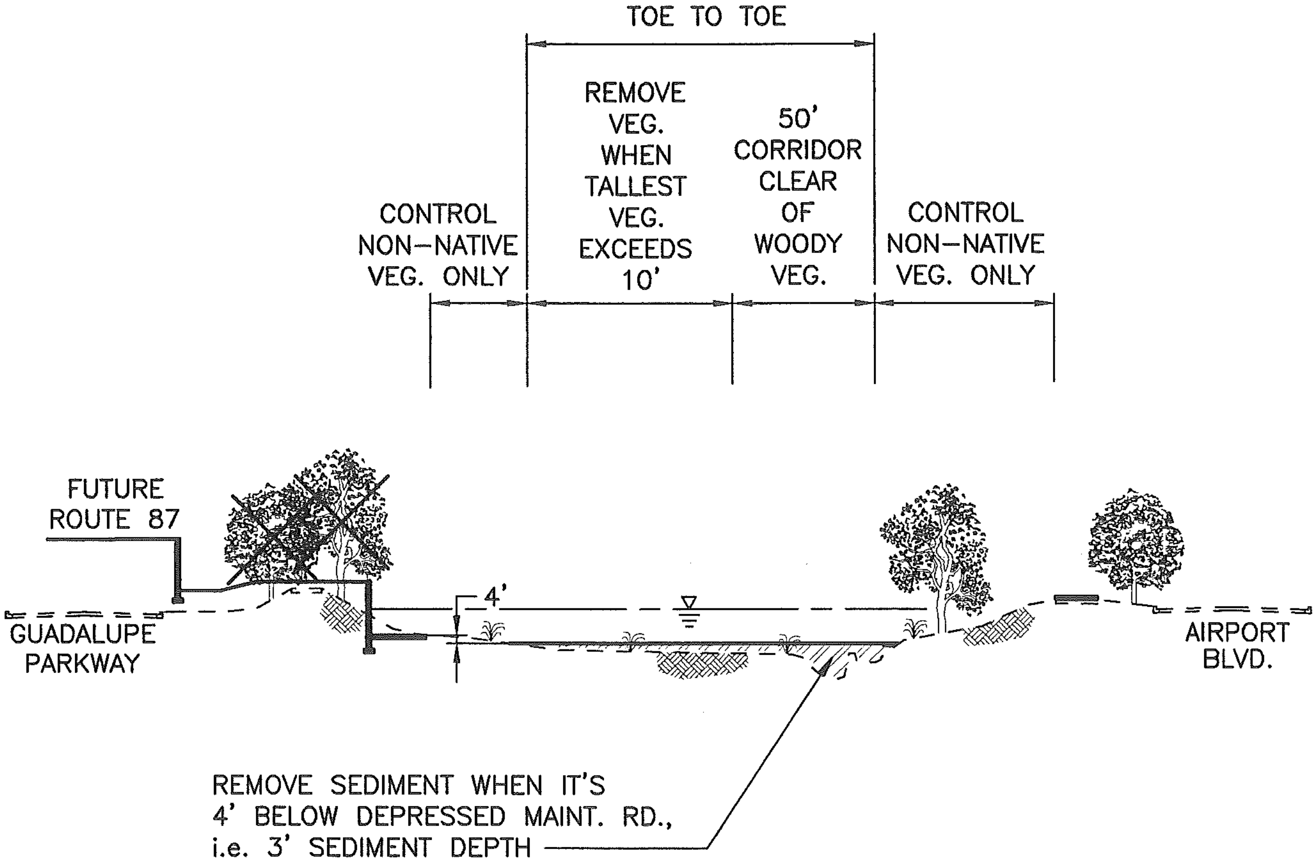
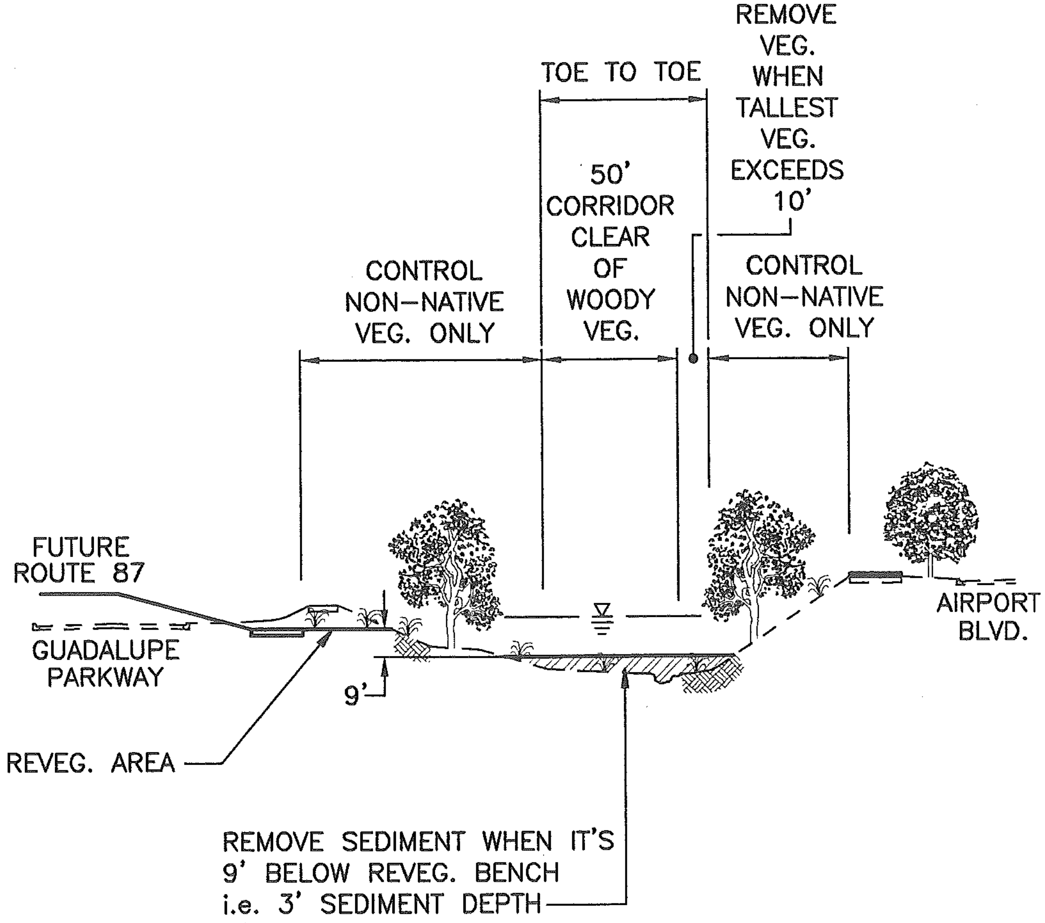

TOE TO TOE
CONTROL NON-NATIVE VEG. ONLY
REMOVE VEG. WHEN TALLEST VEG. EXCEEDS 10'
50' CORRIDOR CLEAR OF WOODY VEG.
CONTROL NON-NATIVE VEG. ONLY
FUTURE ROUTE 87
GUADALUPE PARKWAY
4'
AIRPORT BLVD.
REMOVE SEDIMENT WHEN IT'S 4' BELOW DEPRESSED MAINT. RD., i.e. 3' SEDIMENT DEPTH

TYPICAL SECTION

STA. 537+00± TO STA. 542+50±

NTS

FIGURE 3.53
MAINTENANCE PROGRAM (REACH A)

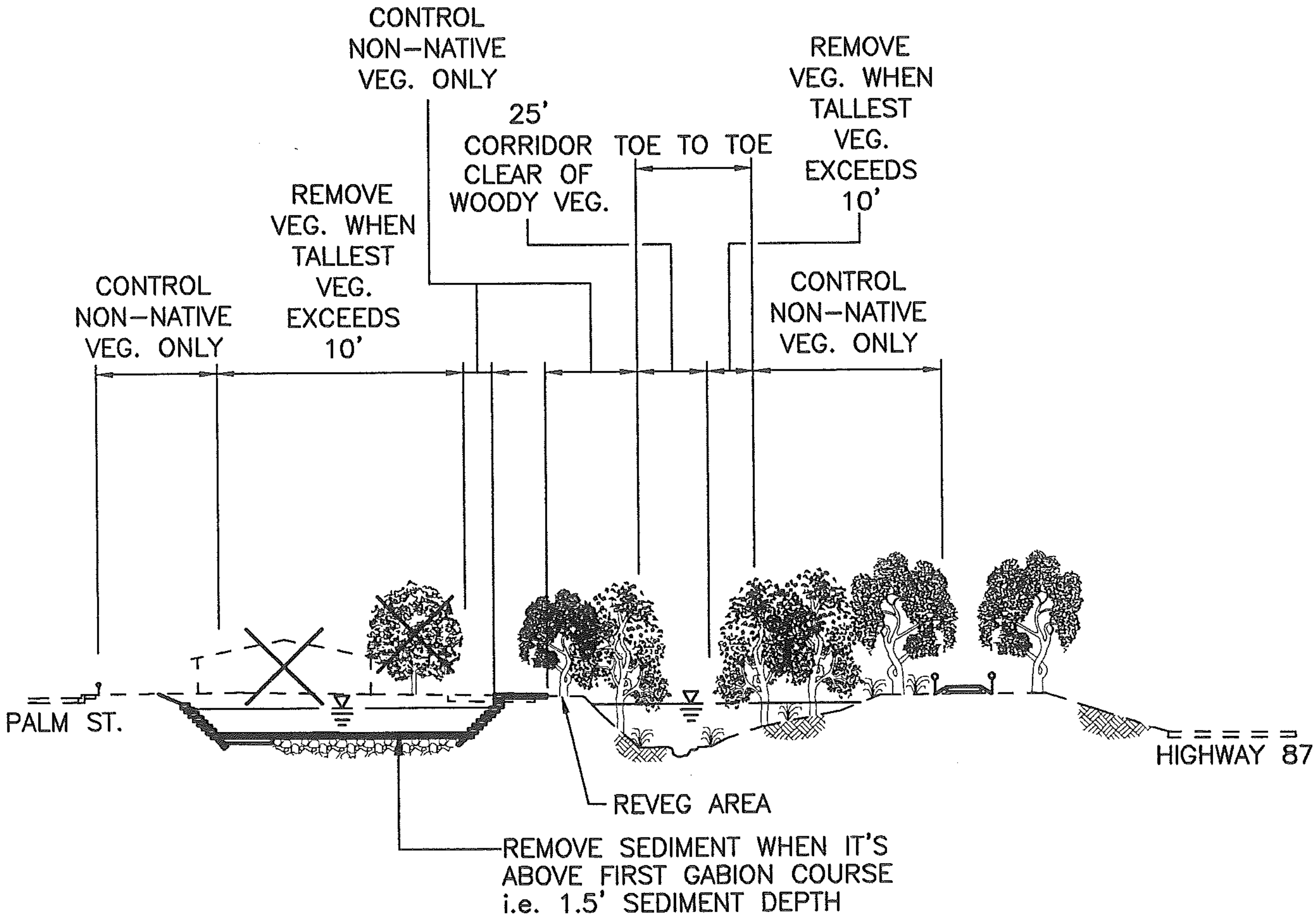

REMOVE VEG. WHEN TALLEST VEG. EXCEEDS 10'
TOE TO TOE
50' CORRIDOR CLEAR OF WOODY VEG.
CONTROL NON-NATIVE VEG. ONLY
CONTROL NON-NATIVE VEG. ONLY
FUTURE ROUTE 87
GUADALUPE PARKWAY
AIRPORT BLVD.
9'
REVEG. AREA
REMOVE SEDIMENT WHEN IT'S 9' BELOW REVEG. BENCH i.e. 3' SEDIMENT DEPTH

TYPICAL SECTION

STA. 548+00± TO STA. 576+00±

NTS

FIGURE 3.54
MAINTENANCE PROGRAM (REACH A)


CONTROL NON-NATIVE VEG. ONLY
25' CORRIDOR CLEAR OF WOODY VEG.
TOE TO TOE
REMOVE VEG. WHEN TALLEST VEG. EXCEEDS 10'
REMOVE VEG. WHEN TALLEST VEG. EXCEEDS 10'
CONTROL NON-NATIVE VEG. ONLY
CONTROL NON-NATIVE VEG. ONLY
PALM ST.
HIGHWAY 87
REVEG AREA
REMOVE SEDIMENT WHEN IT'S ABOVE FIRST GABION COURSE i.e. 1.5' SEDIMENT DEPTH

TYPICAL SECTION

STA. 718+50± TO STA. 725+00±

NTS

FIGURE 3.55
MAINTENANCE PROGRAM (REACH 6)

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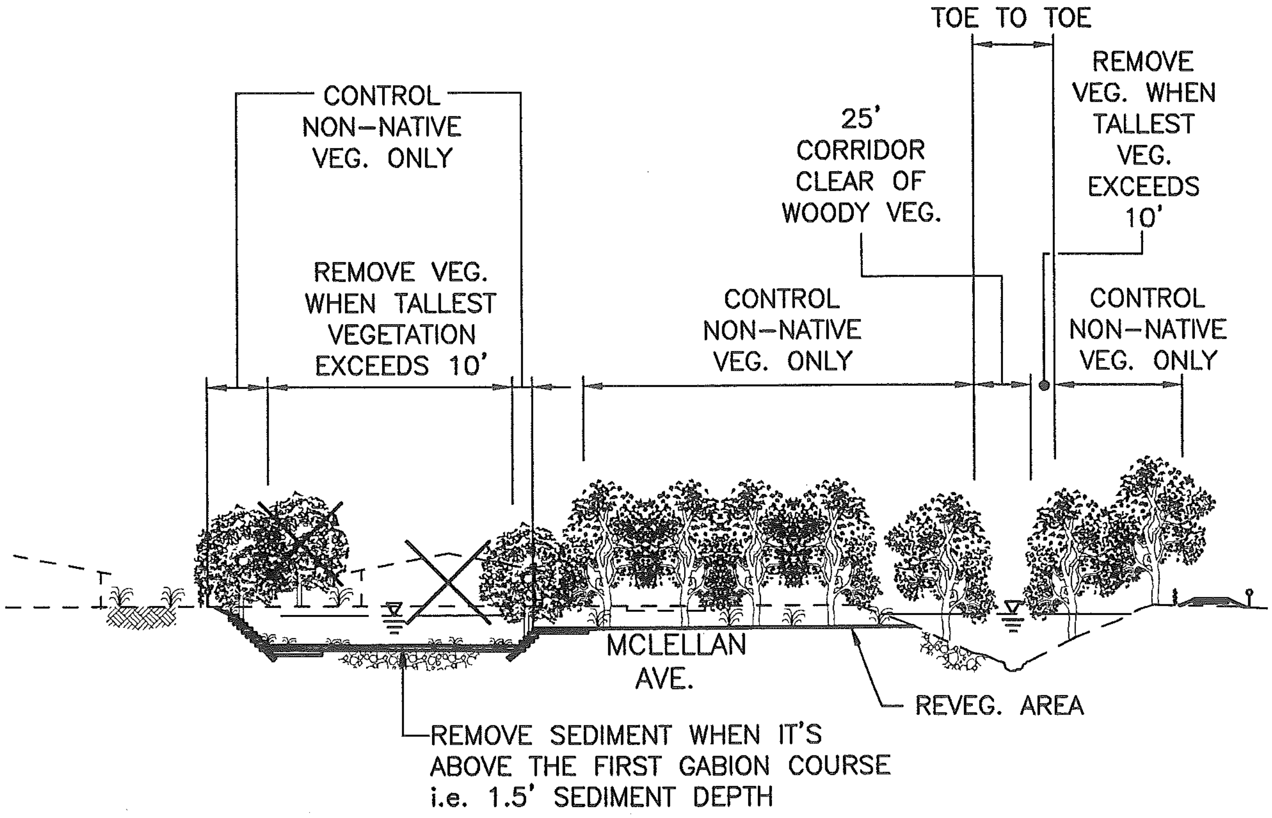
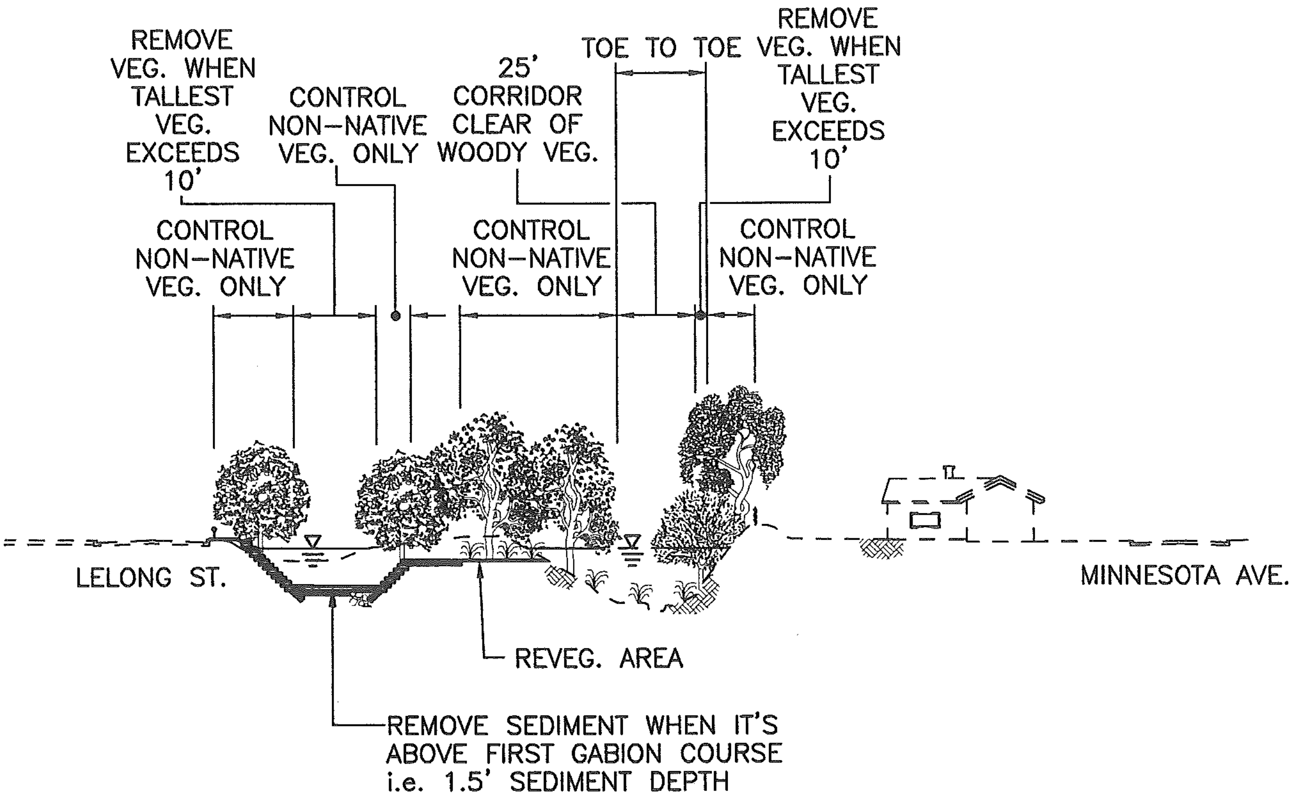

TOE TO TOE
CONTROL NON-NATIVE VEG. ONLY
25' CORRIDOR CLEAR OF WOODY VEG.
REMOVE VEG. WHEN TALLEST VEG. EXCEEDS 10'
REMOVE VEG. WHEN TALLEST VEGETATION EXCEEDS 10'
CONTROL NON-NATIVE VEG. ONLY
CONTROL NON-NATIVE VEG. ONLY
MCLELLAN AVE.
REVEG. AREA
REMOVE SEDIMENT WHEN IT'S ABOVE THE FIRST GABION COURSE i.e. 1.5' SEDIMENT DEPTH

TYPICAL SECTION

STA. 731+10± TO STA. 737+40±

NTS

FIGURE 3.56
MAINTENANCE PROGRAM (REACH 6)


REMOVE VEG. WHEN TALLEST VEG. EXCEEDS 10'
CONTROL NON-NATIVE VEG. ONLY
25' CORRIDOR CLEAR OF WOODY VEG.
TOE TO TOE
REMOVE VEG. WHEN TALLEST VEG. EXCEEDS 10'
CONTROL NON-NATIVE VEG. ONLY
CONTROL NON-NATIVE VEG. ONLY
CONTROL NON-NATIVE VEG. ONLY
LELONG ST.
MINNESOTA AVE.
REVEG. AREA
REMOVE SEDIMENT WHEN IT'S ABOVE FIRST GABION COURSE i.e. 1.5' SEDIMENT DEPTH

TYPICAL SECTION

STA. 751+85± TO STA. 769+00±

NTS

FIGURE 3.57
MAINTENANCE PROGRAM (REACH 7)

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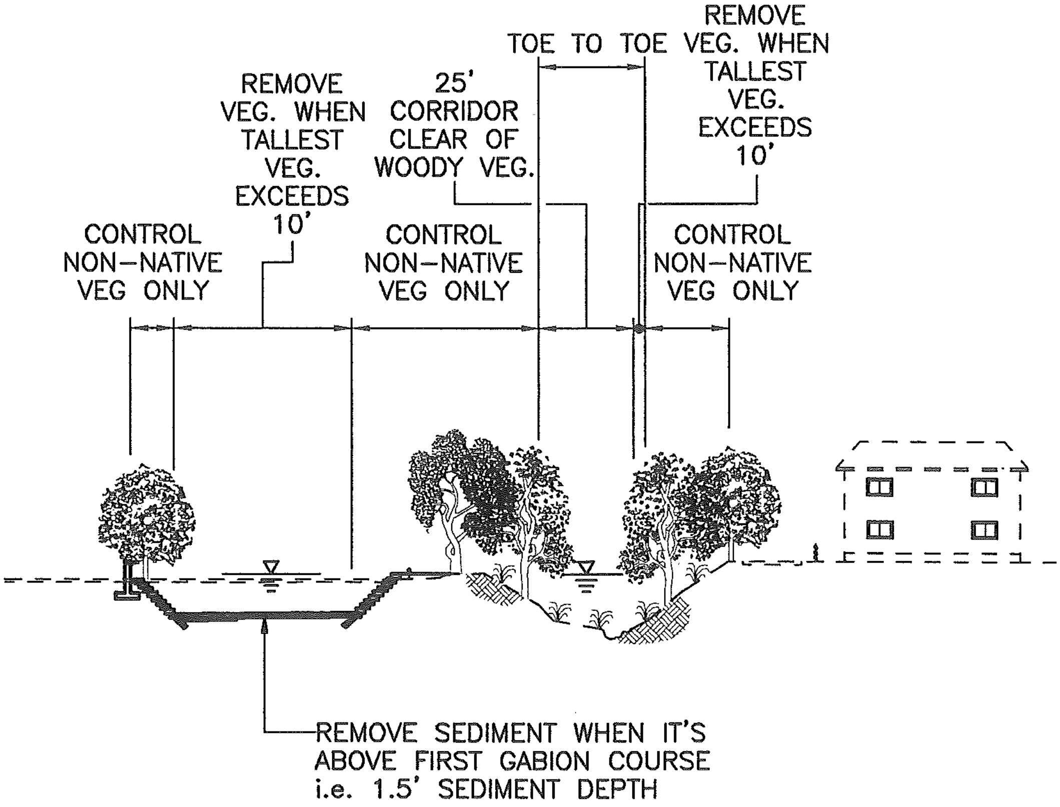
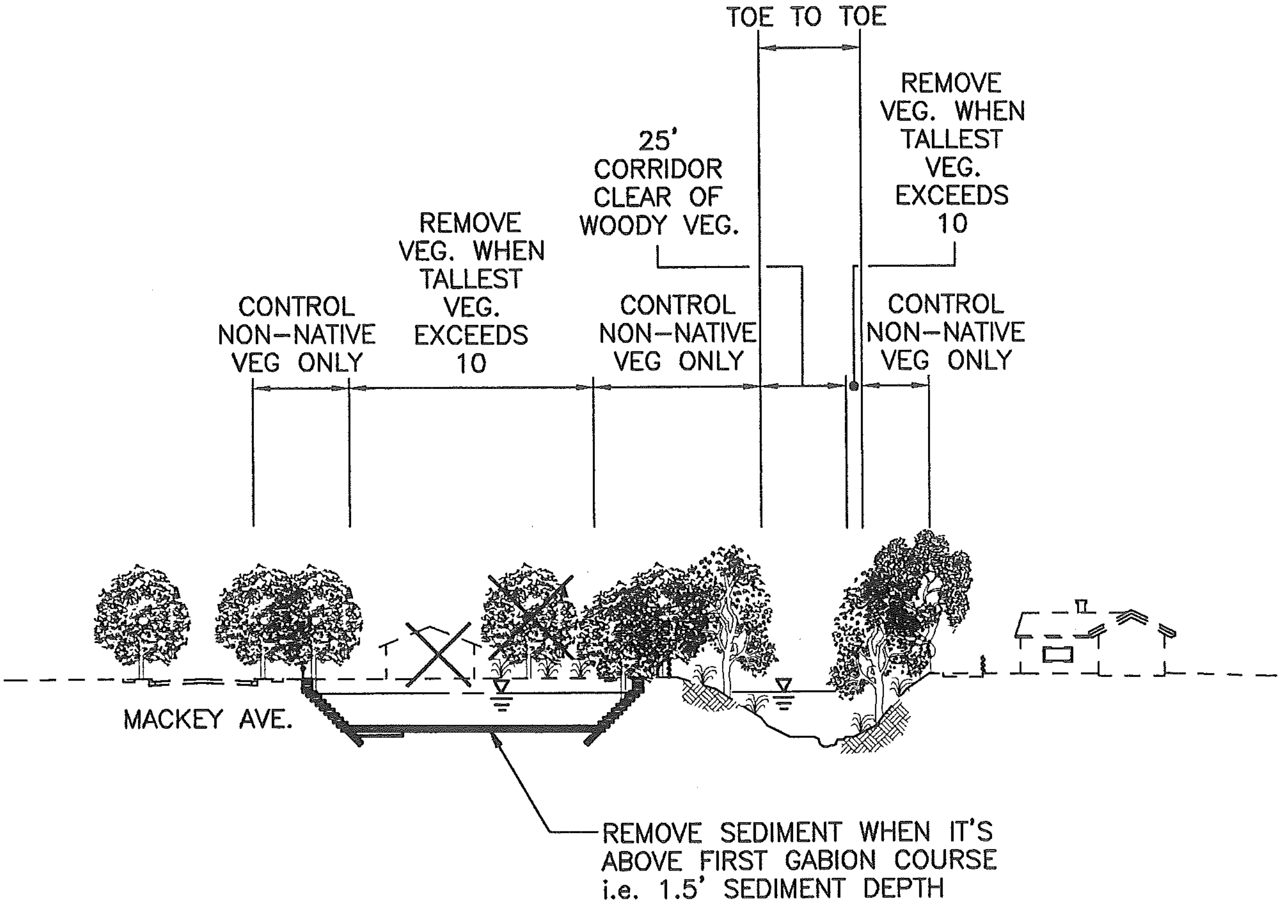

TOE TO TOE
REMOVE VEG. WHEN TALLEST VEG. EXCEEDS 10'
REMOVE VEG. WHEN TALLEST VEG. EXCEEDS 10'
25' CORRIDOR CLEAR OF WOODY VEG.
CONTROL NON-NATIVE VEG ONLY
CONTROL NON-NATIVE VEG ONLY
CONTROL NON-NATIVE VEG ONLY
REMOVE SEDIMENT WHEN IT'S ABOVE FIRST GABION COURSE i.e. 1.5' SEDIMENT DEPTH

TYPICAL SECTION

STA. 775+70± TO STA. 780+70±

NTS

FIGURE 3.58
MAINTENANCE PROGRAM (REACH 7)


TOE TO TOE
REMOVE VEG. WHEN TALLEST VEG. EXCEEDS 10
25' CORRIDOR CLEAR OF WOODY VEG.
REMOVE VEG. WHEN TALLEST VEG. EXCEEDS 10
CONTROL NON-NATIVE VEG ONLY
CONTROL NON-NATIVE VEG ONLY
CONTROL NON-NATIVE VEG ONLY
MACKEY AVE.
REMOVE SEDIMENT WHEN IT'S ABOVE FIRST GABION COURSE i.e. 1.5' SEDIMENT DEPTH

TYPICAL SECTION

STA. 785+25± TO STA. 792+80±

NTS

FIGURE 3.59
MAINTENANCE PROGRAM (REACH 8)

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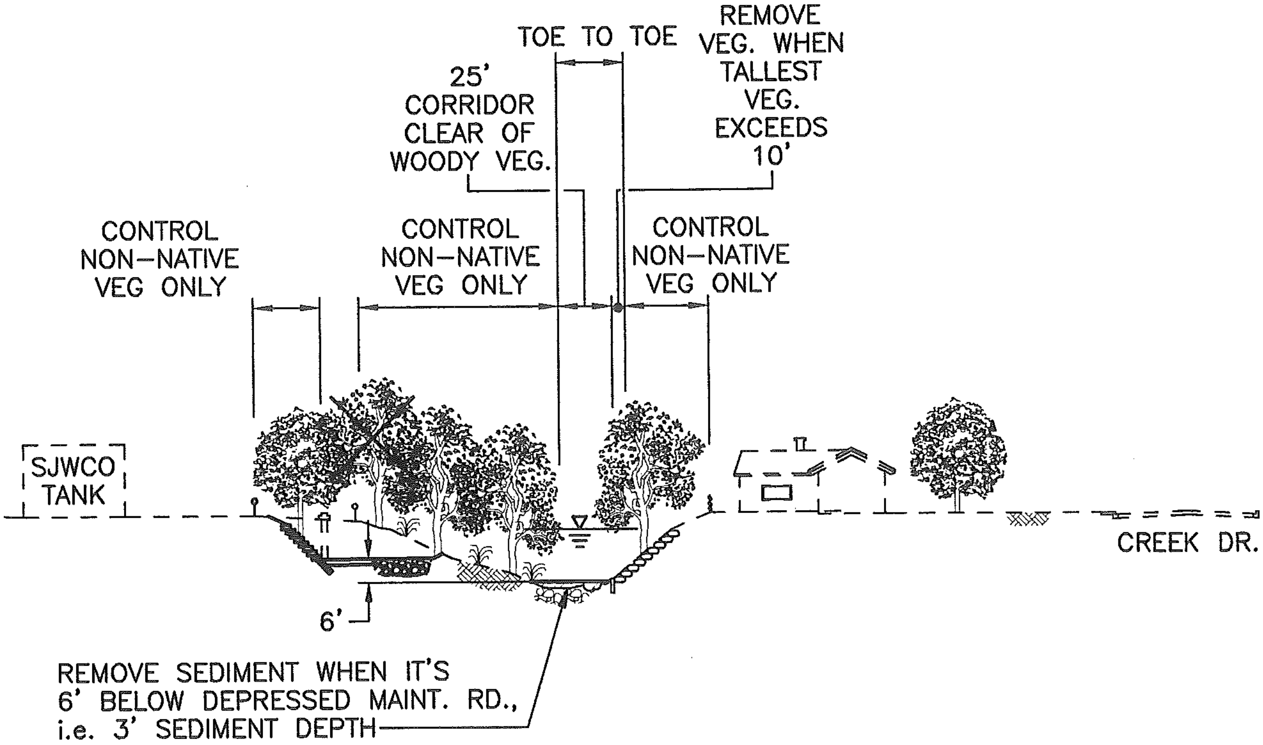
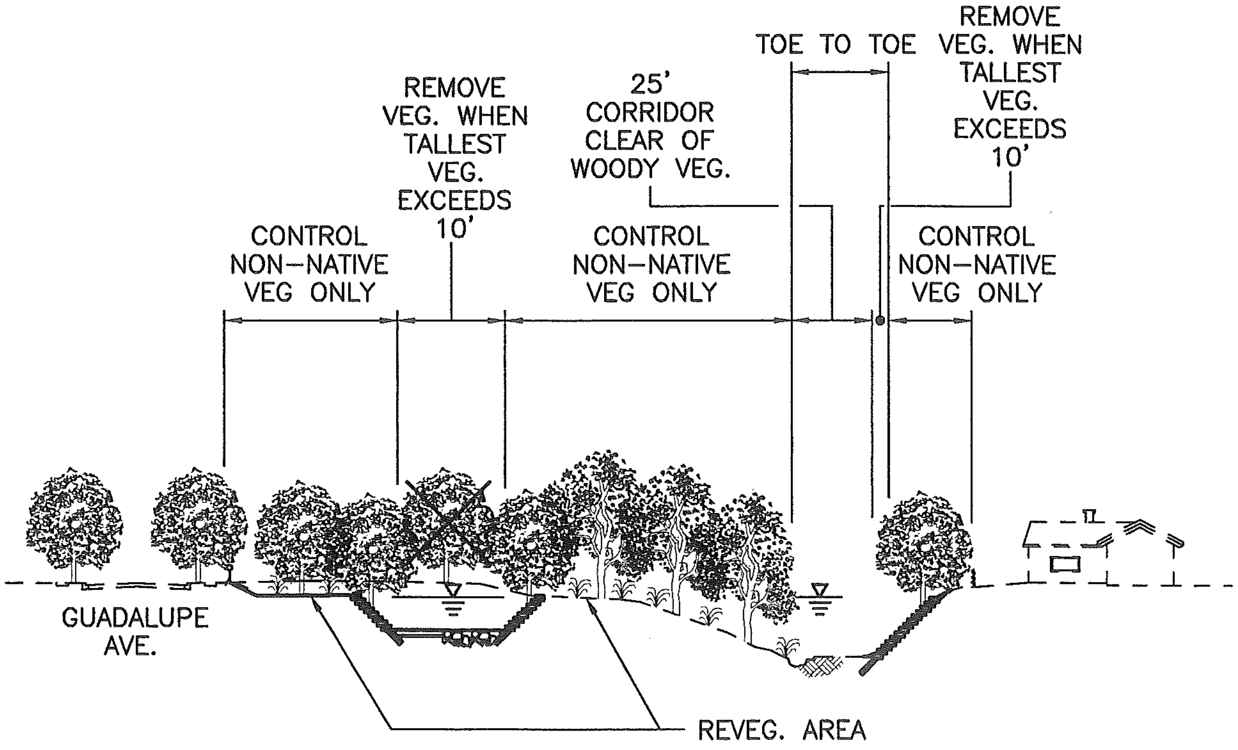

TOE TO TOE
REMOVE VEG. WHEN TALLEST VEG. EXCEEDS 10'
25' CORRIDOR CLEAR OF WOODY VEG.
CONTROL NON-NATIVE VEG ONLY
CONTROL NON-NATIVE VEG ONLY
CONTROL NON-NATIVE VEG ONLY
SJWCO TANK
CREEK DR.
6'
REMOVE SEDIMENT WHEN IT'S 6' BELOW DEPRESSED MAINT. RD., i.e. 3' SEDIMENT DEPTH

TYPICAL SECTION

STA. 797+00± TO STA. 801+00±

NTS

FIGURE 3.60
MAINTENANCE PROGRAM (REACH 9)


REMOVE VEG. WHEN TALLEST VEG. EXCEEDS 10'
TOE TO TOE
25' CORRIDOR CLEAR OF WOODY VEG.
REMOVE VEG. WHEN TALLEST VEG. EXCEEDS 10'
CONTROL NON-NATIVE VEG ONLY
CONTROL NON-NATIVE VEG ONLY
CONTROL NON-NATIVE VEG ONLY
GUADALUPE AVE.
REVEG. AREA

TYPICAL SECTION

STA. 802+00± TO STA. 806+00±
NTS

FIGURE 3.61
MAINTENANCE PROGRAM (REACH 9)

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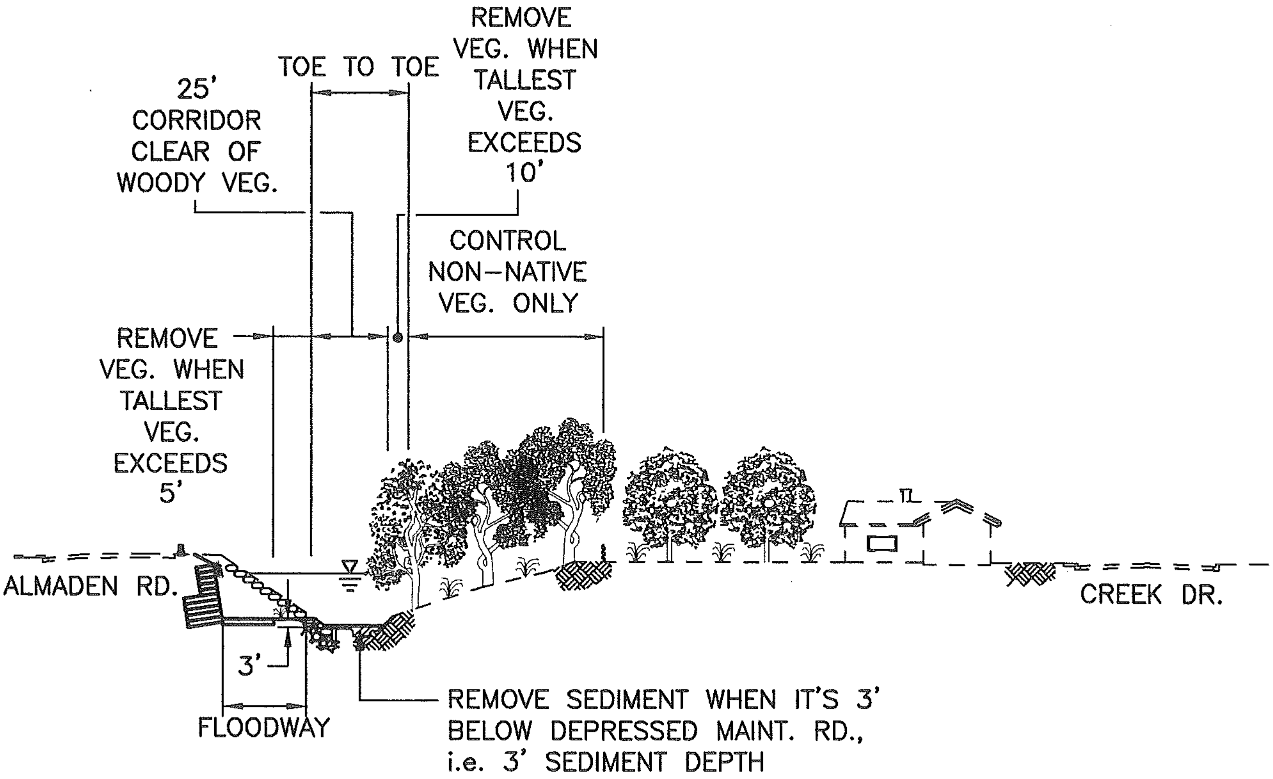
REMOVE VEG. WHEN TALLEST VEG. EXCEEDS 10'
TOE TO TOE
25' CORRIDOR CLEAR OF WOODY VEG.
CONTROL NON-NATIVE VEG. ONLY
REMOVE VEG. WHEN TALLEST VEG. EXCEEDS 5'
ALMADEN RD.
CREEK DR.
3'
FLOODWAY
REMOVE SEDIMENT WHEN IT'S 3' BELOW DEPRESSED MAINT. RD., i.e. 3' SEDIMENT DEPTH

TYPICAL SECTION

STA. 810+00± TO STA. 812+00±

NTS

FIGURE 3.62
MAINTENANCE PROGRAM (REACH 9)

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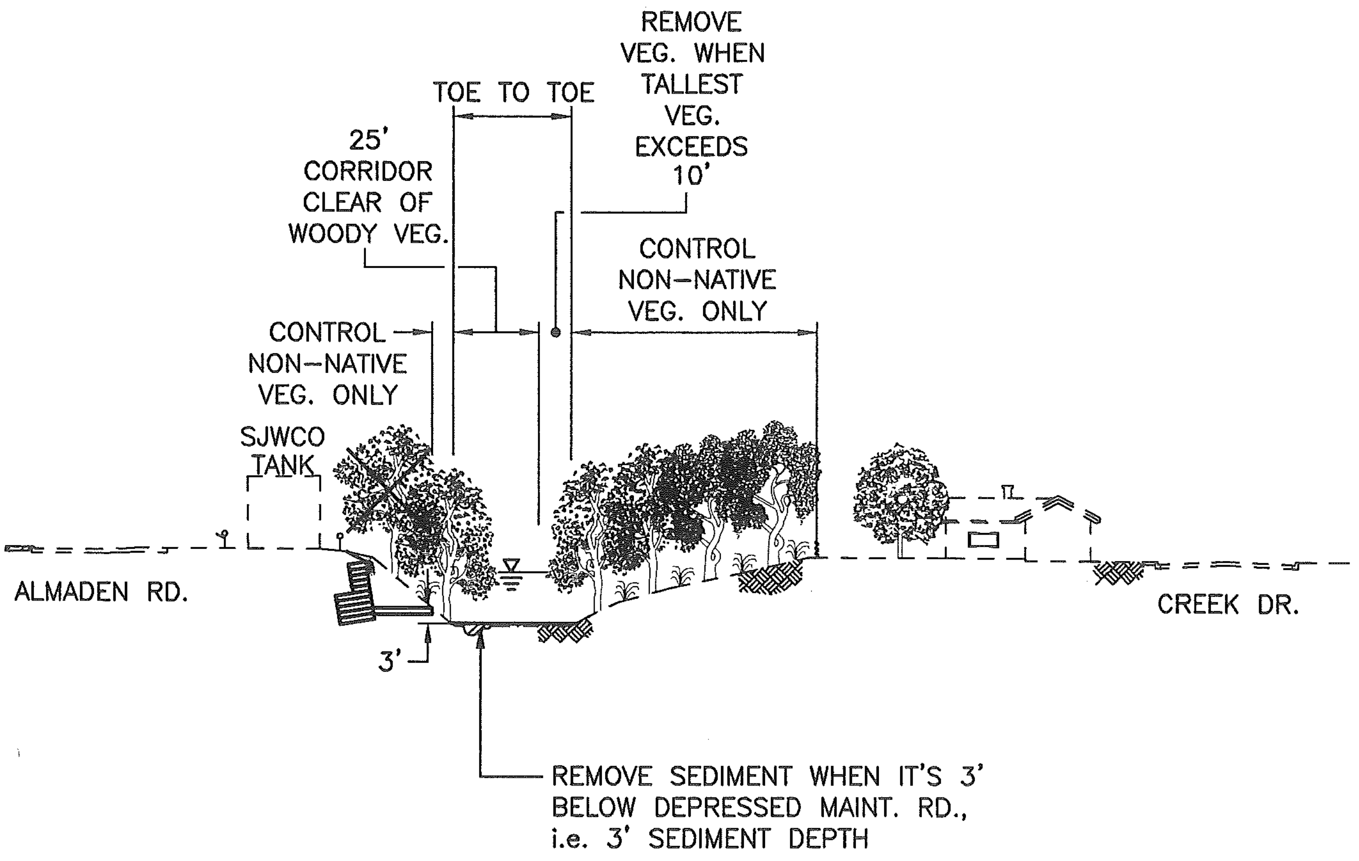
REMOVE VEG. WHEN TALLEST VEG. EXCEEDS 10'
TOE TO TOE
25' CORRIDOR CLEAR OF WOODY VEG.
CONTROL NON-NATIVE VEG. ONLY
CONTROL NON-NATIVE VEG. ONLY
SJWCO TANK
ALMADEN RD.
CREEK DR.
3'
REMOVE SEDIMENT WHEN IT'S 3' BELOW DEPRESSED MAINT. RD., i.e. 3' SEDIMENT DEPTH

TYPICAL SECTION

STA. 815+50± TO STA. 817+00±

NTS

FIGURE 3.63
MAINTENANCE PROGRAM (REACH 9)

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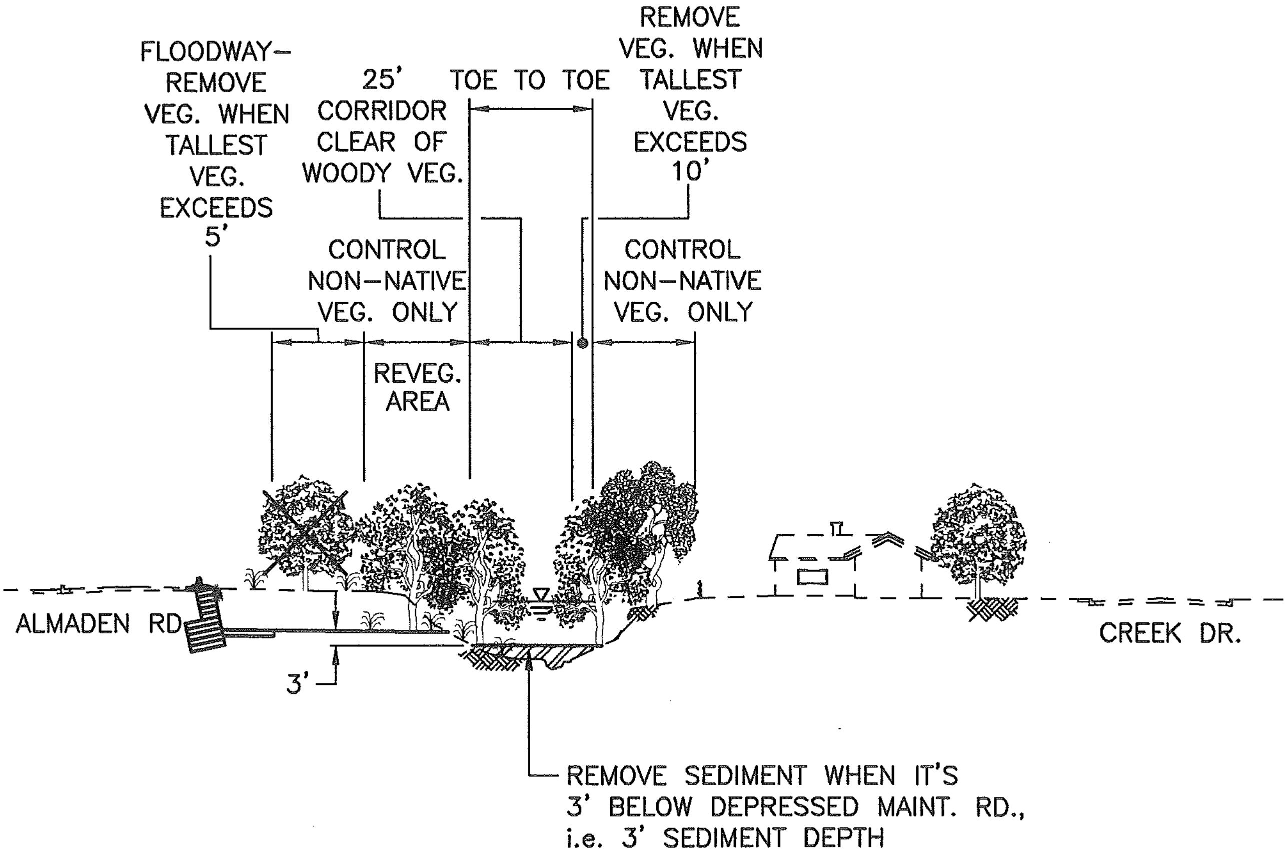
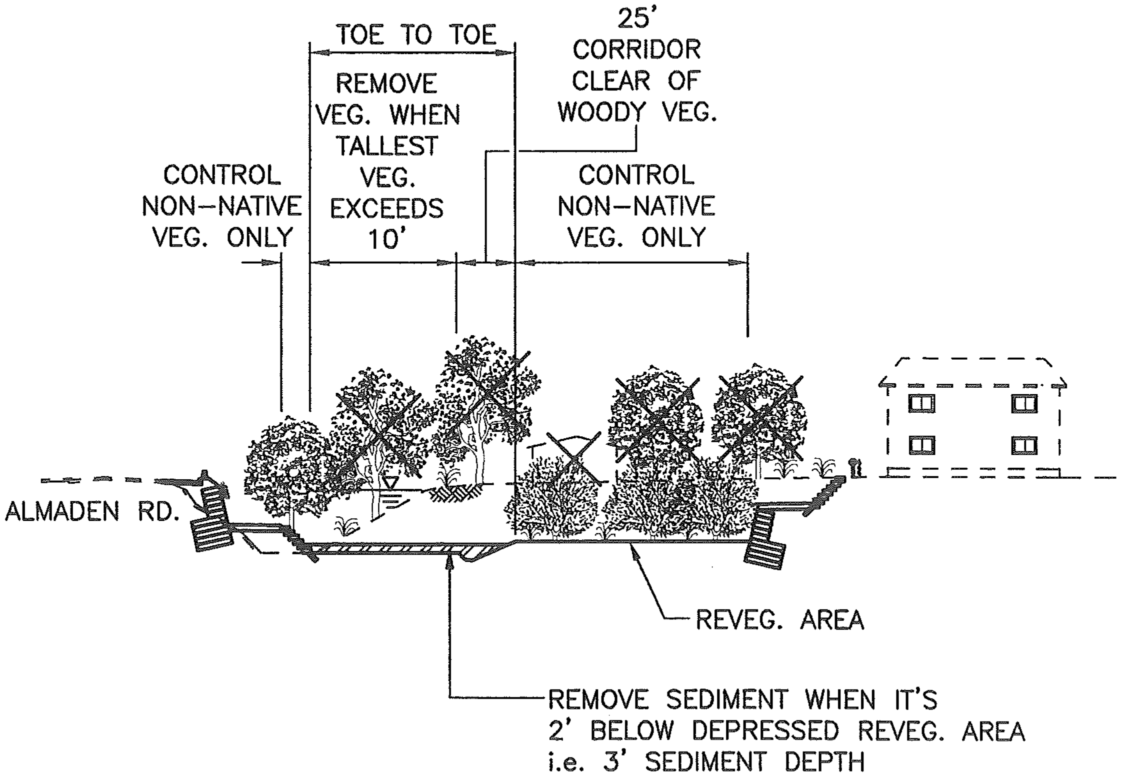


TYPICAL SECTION

STA. 817+70± TO STA. 821+50±

NTS

FIGURE 3.64
MAINTENANCE PROGRAM (REACH 9)


TOE TO TOE
25' CORRIDOR CLEAR OF WOODY VEG.
REMOVE VEG. WHEN TALLEST VEG. EXCEEDS 10'
CONTROL NON-NATIVE VEG. ONLY
CONTROL NON-NATIVE VEG. ONLY
ALMADEN RD.
REVEG. AREA
REMOVE SEDIMENT WHEN IT'S 2' BELOW DEPRESSED REVEG. AREA i.e. 3' SEDIMENT DEPTH

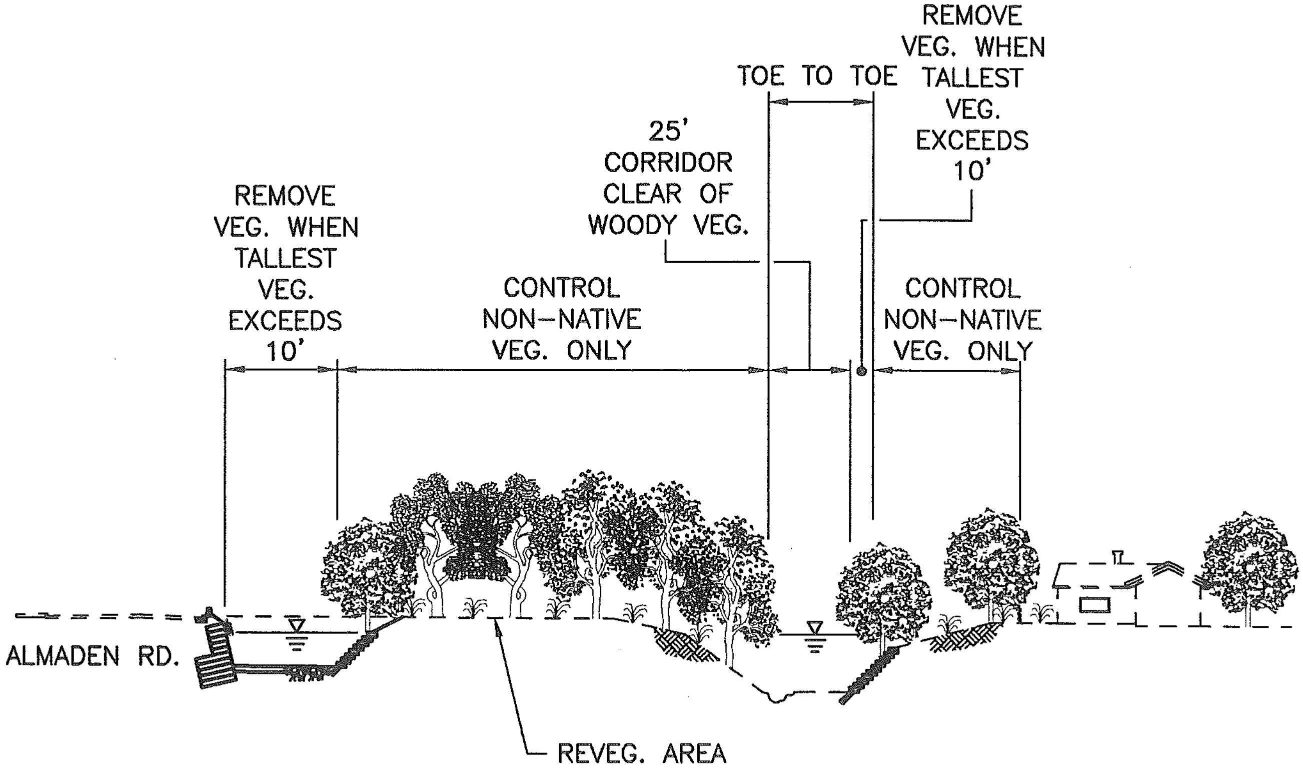
TYPICAL SECTION

STA. 822+00± TO STA. 826+50±

NTS

FIGURE 3.65

MAINTENANCE PROGRAM (REACH 9)


REMOVE VEG. WHEN TALLEST VEG. EXCEEDS 10'
TOE TO TOE
25' CORRIDOR CLEAR OF WOODY VEG.
REMOVE VEG. WHEN TALLEST VEG. EXCEEDS 10'
CONTROL NON-NATIVE VEG. ONLY
CONTROL NON-NATIVE VEG. ONLY
ALMADEN RD.
REVEG. AREA

TYPICAL SECTION

STA. 827+00± TO STA. 830+00±

NTS

FIGURE 3.66
MAINTENANCE PROGRAM (REACH 9)

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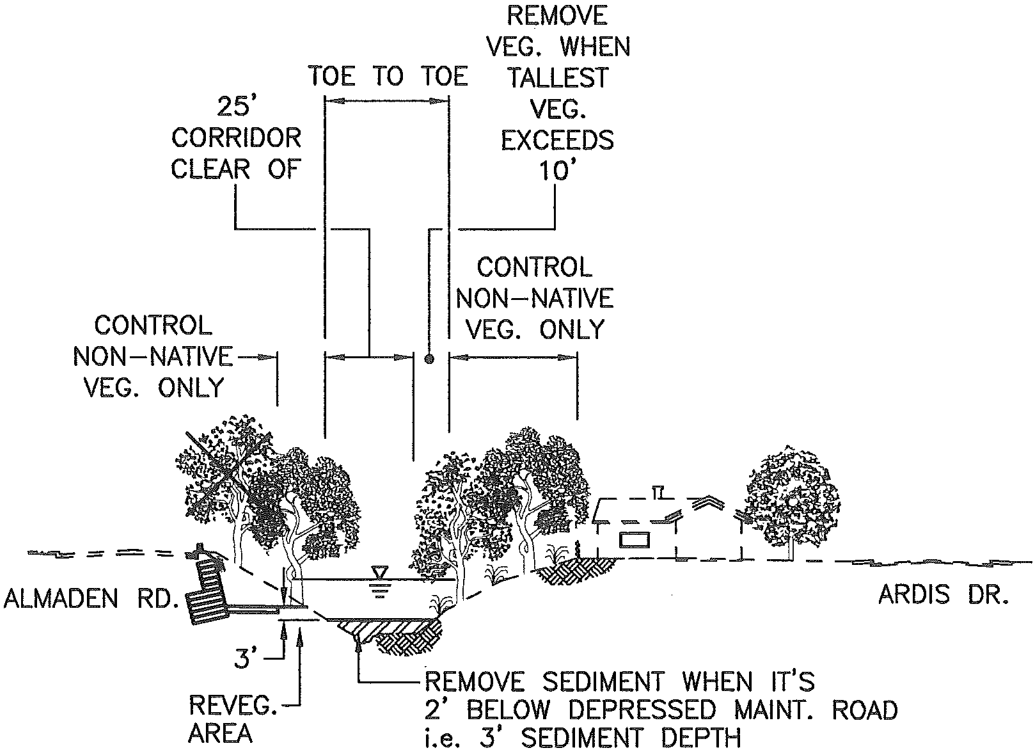

REMOVE VEG. WHEN TALLEST VEG. EXCEEDS 10'
TOE TO TOE
25' CORRIDOR CLEAR OF
CONTROL NON-NATIVE VEG. ONLY
CONTROL NON-NATIVE VEG. ONLY
ALMADEN RD.
ARDIS DR.
3'
REVEG. AREA
REMOVE SEDIMENT WHEN IT'S 2' BELOW DEPRESSED MAINT. ROAD i.e. 3' SEDIMENT DEPTH

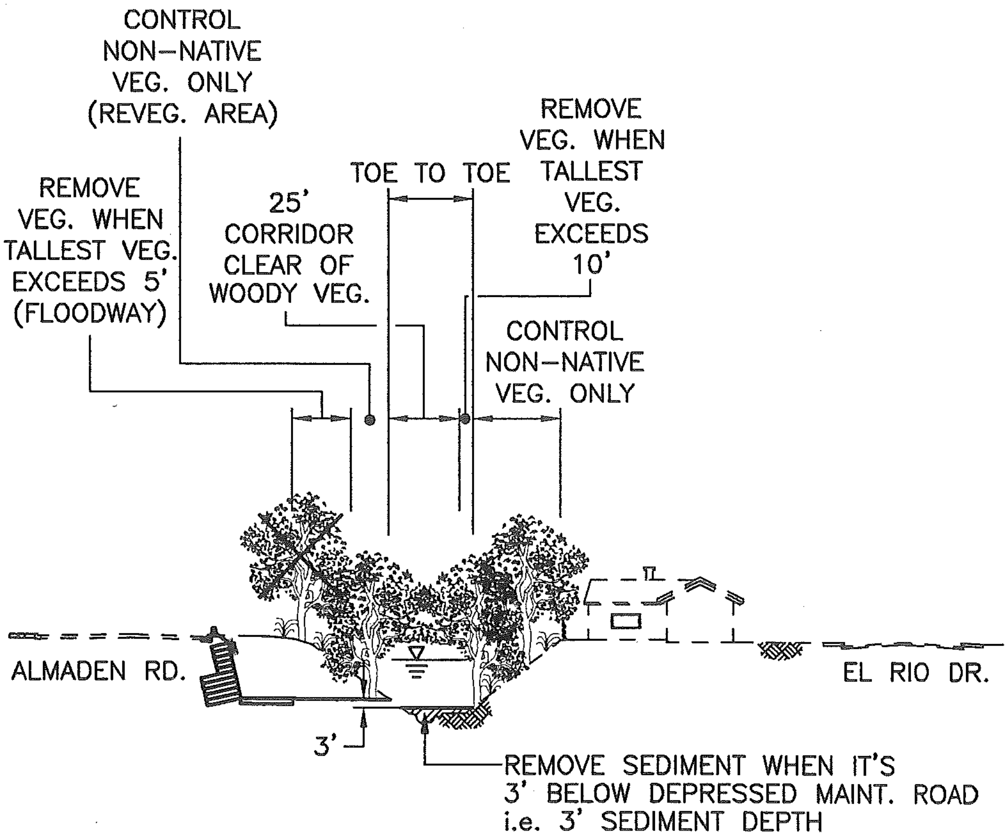
TYPICAL SECTION

STA. 832+00± TO STA. 842+00±

NTS

FIGURE 3.67
MAINTENANCE PROGRAM (REACH 9)

w:\dwgs\p\3015_104\maint\asize\m832-00.dwg


CONTROL NON-NATIVE VEG. ONLY (REVEG. AREA)
REMOVE VEG. WHEN TALLEST VEG. EXCEEDS 10'
TOE TO TOE
REMOVE VEG. WHEN TALLEST VEG. EXCEEDS 5' (FLOODWAY)
25' CORRIDOR CLEAR OF WOODY VEG.
CONTROL NON-NATIVE VEG. ONLY
ALMADEN RD.
EL RIO DR.
3'
REMOVE SEDIMENT WHEN IT'S 3' BELOW DEPRESSED MAINT. ROAD i.e. 3' SEDIMENT DEPTH

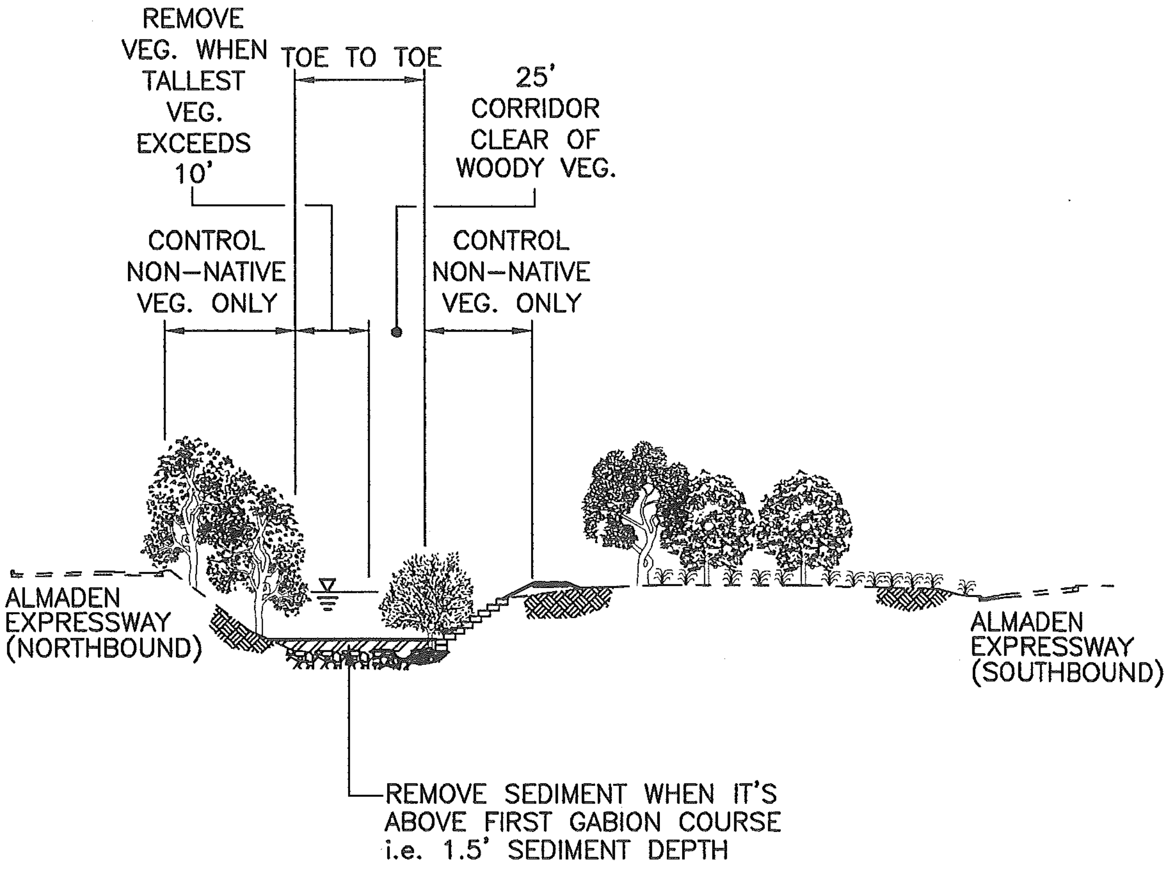
TYPICAL SECTION

STA. 843+50± TO STA. 854+50±

NTS

FIGURE 3.68
MAINTENANCE PROGRAM (REACH 10)

w:\dwgs\p\3015_104\maint\asize\m843-50.dwg


REMOVE VEG. WHEN TALLEST VEG. EXCEEDS 10'
TOE TO TOE
25' CORRIDOR CLEAR OF WOODY VEG.
CONTROL NON-NATIVE VEG. ONLY
CONTROL NON-NATIVE VEG. ONLY
ALMADEN EXPRESSWAY (NORTHBOUND)
ALMADEN EXPRESSWAY (SOUTHBOUND)
REMOVE SEDIMENT WHEN IT'S ABOVE FIRST GABION COURSE i.e. 1.5' SEDIMENT DEPTH

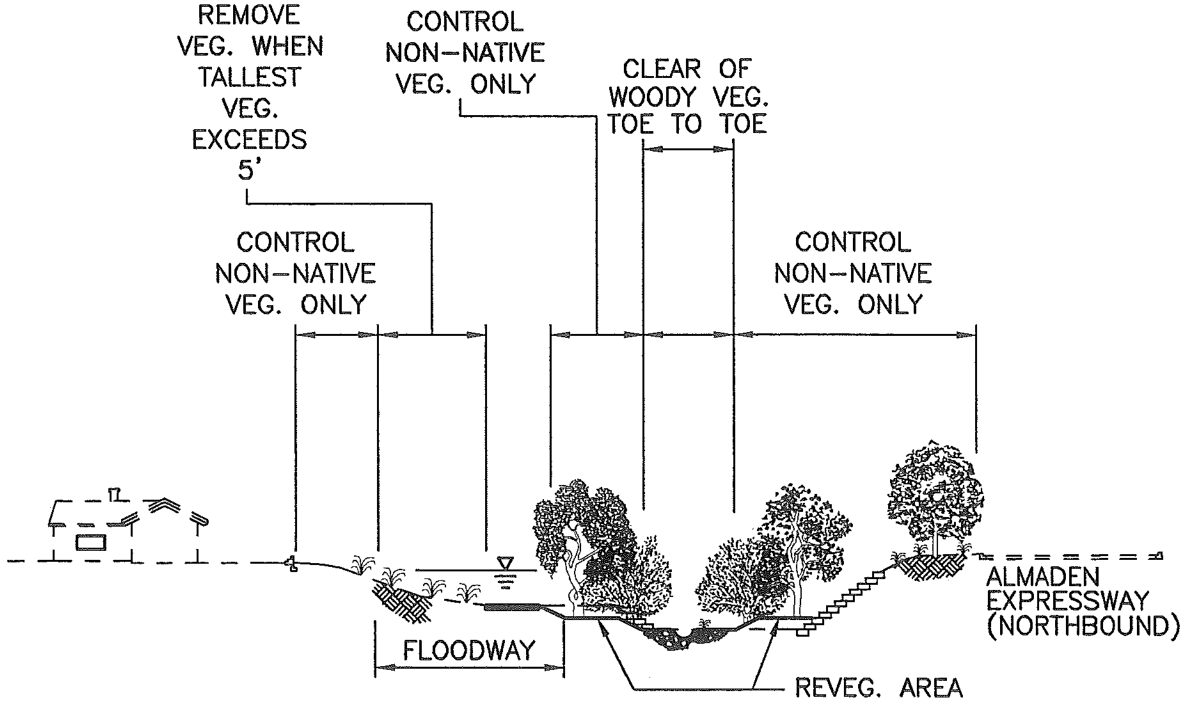
TYPICAL SECTION

STA. 858+20± TO STA. 868+950±

NTS

FIGURE 3.69
MAINTENANCE PROGRAM (REACH 10)

w:\dwgs\p\3015_104\maint\asize\m858-20.dwg


REMOVE VEG. WHEN TALLEST VEG. EXCEEDS 5'
CONTROL NON-NATIVE VEG. ONLY
CLEAR OF WOODY VEG. TOE TO TOE
CONTROL NON-NATIVE VEG. ONLY
CONTROL NON-NATIVE VEG. ONLY
FLOODWAY
REVEG. AREA
ALMADEN EXPRESSWAY (NORTHBOUND)

TYPICAL SECTION

STA. 873+20± TO STA. 885+50±

NTS

FIGURE 3.70
MAINTENANCE PROGRAM (REACH 10)

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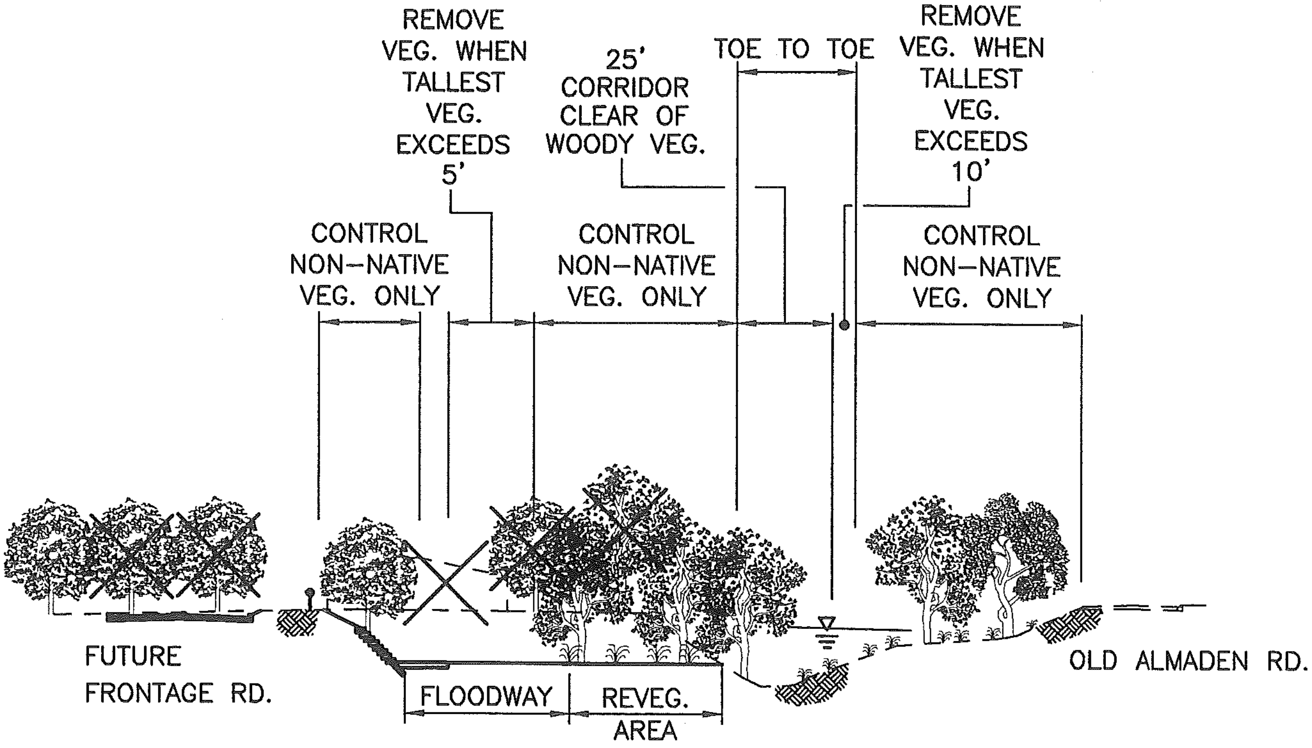
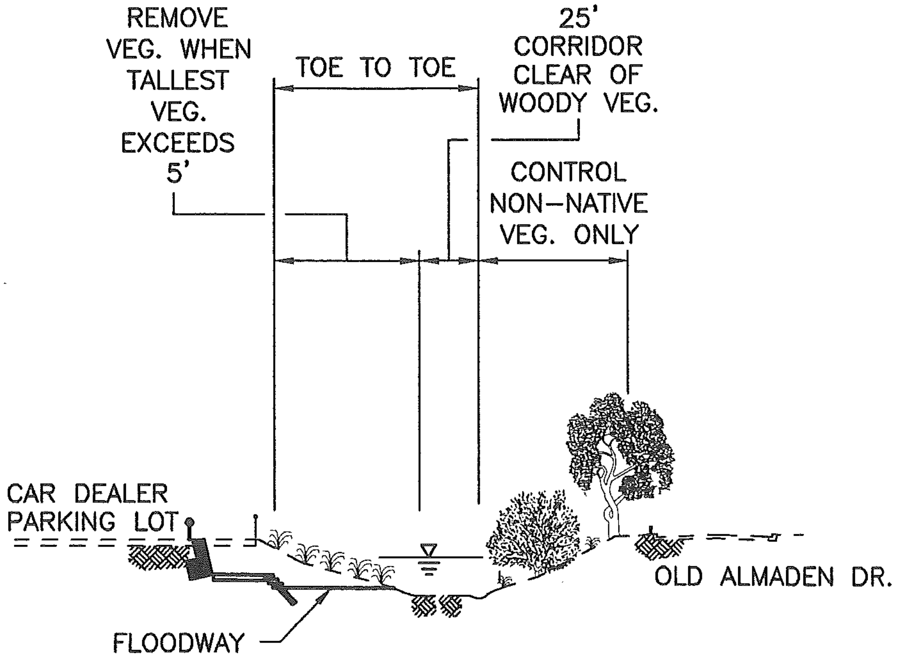

REMOVE VEG. WHEN TALLEST VEG. EXCEEDS 5'
25' CORRIDOR CLEAR OF WOODY VEG.
TOE TO TOE
REMOVE VEG. WHEN TALLEST VEG. EXCEEDS 10'
CONTROL NON-NATIVE VEG. ONLY
CONTROL NON-NATIVE VEG. ONLY
CONTROL NON-NATIVE VEG. ONLY
FUTURE FRONTAGE RD.
FLOODWAY
REVEG. AREA
OLD ALMADEN RD.

TYPICAL SECTION

STA. 887+80± TO STA. 903+00±

NTS

FIGURE 3.71
MAINTENANCE PROGRAM (REACH 10)



REMOVE VEG. WHEN TALLEST VEG. EXCEEDS 5'
TOE TO TOE
25' CORRIDOR CLEAR OF WOODY VEG.
CONTROL NON-NATIVE VEG. ONLY
CAR DEALER PARKING LOT
OLD ALMADEN DR.
FLOODWAY

TYPICAL SECTION

STA. 906+15± TO STA. 910+00±

NTS

FIGURE 3.72
MAINTENANCE PROGRAM (REACH 10)

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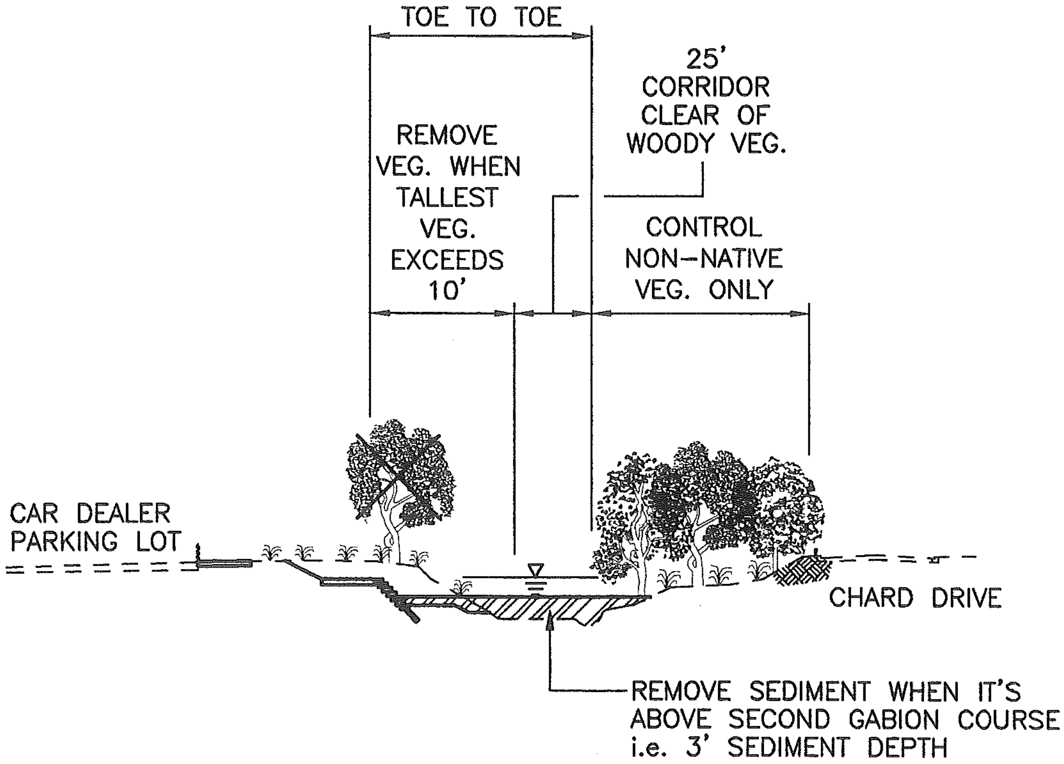
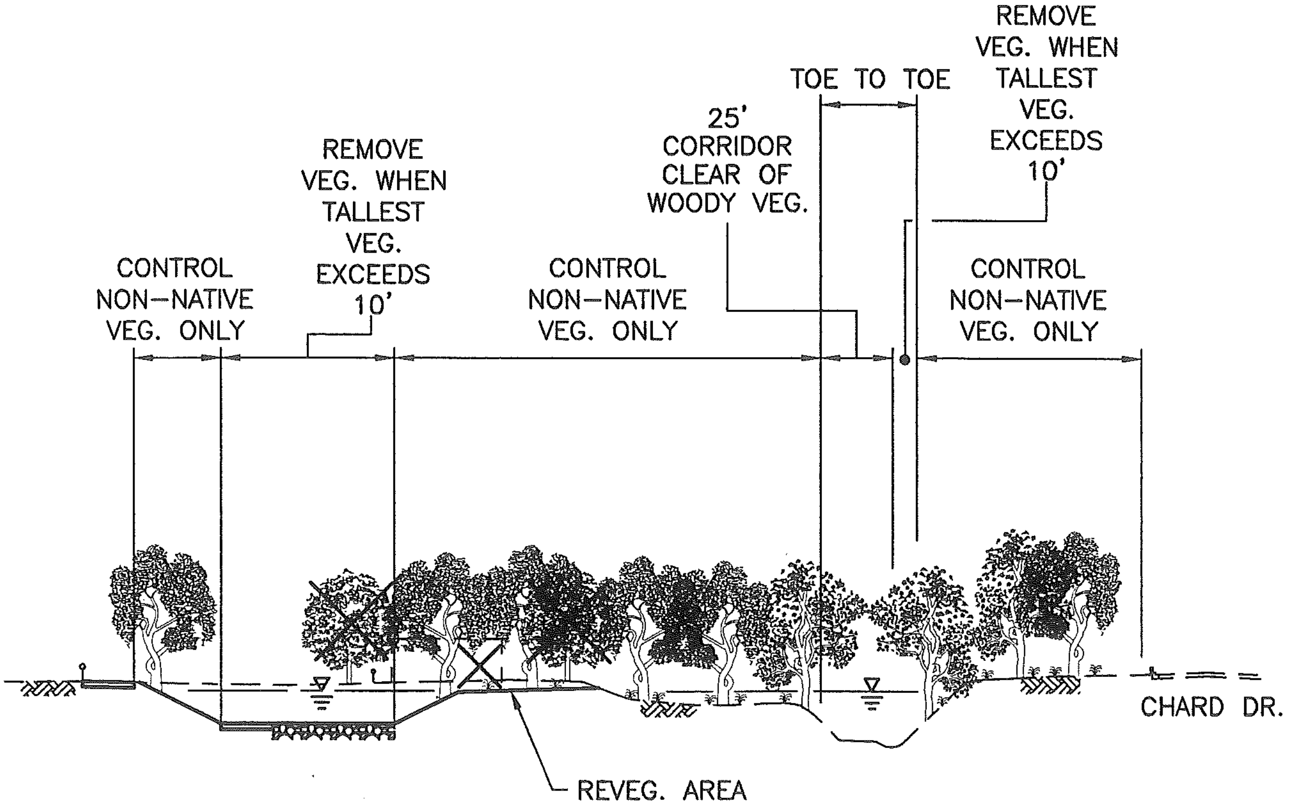

TOE TO TOE
25' CORRIDOR CLEAR OF WOODY VEG.
REMOVE VEG. WHEN TALLEST VEG. EXCEEDS 10'
CONTROL NON-NATIVE VEG. ONLY
CAR DEALER PARKING LOT
CHARD DRIVE
REMOVE SEDIMENT WHEN IT'S ABOVE SECOND GABION COURSE i.e. 3' SEDIMENT DEPTH

TYPICAL SECTION

STA. 912+00± TO STA. 915+00±

NTS

FIGURE 3.73
MAINTENANCE PROGRAM (REACH 11)


REMOVE VEG. WHEN TALLEST VEG. EXCEEDS 10'
TOE TO TOE
25' CORRIDOR CLEAR OF WOODY VEG.
REMOVE VEG. WHEN TALLEST VEG. EXCEEDS 10'
CONTROL NON-NATIVE VEG. ONLY
CONTROL NON-NATIVE VEG. ONLY
CONTROL NON-NATIVE VEG. ONLY
CHARD DR.
REVEG. AREA

TYPICAL SECTION

STA. 917+00± TO STA. 920+00±

NTS

FIGURE 3.74
MAINTENANCE PROGRAM (REACH 11)

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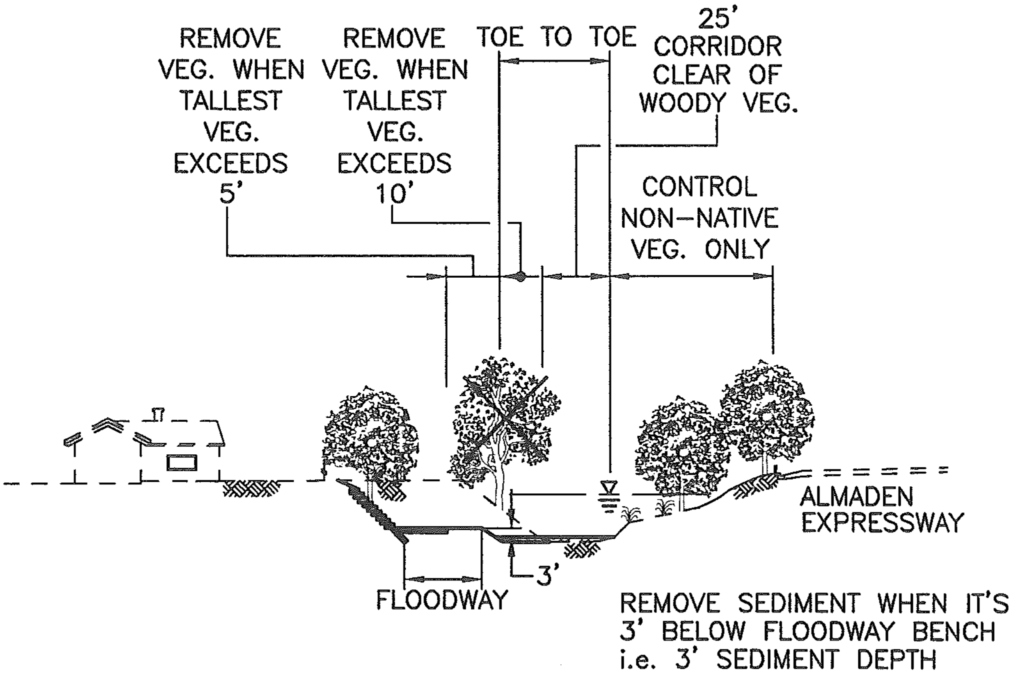
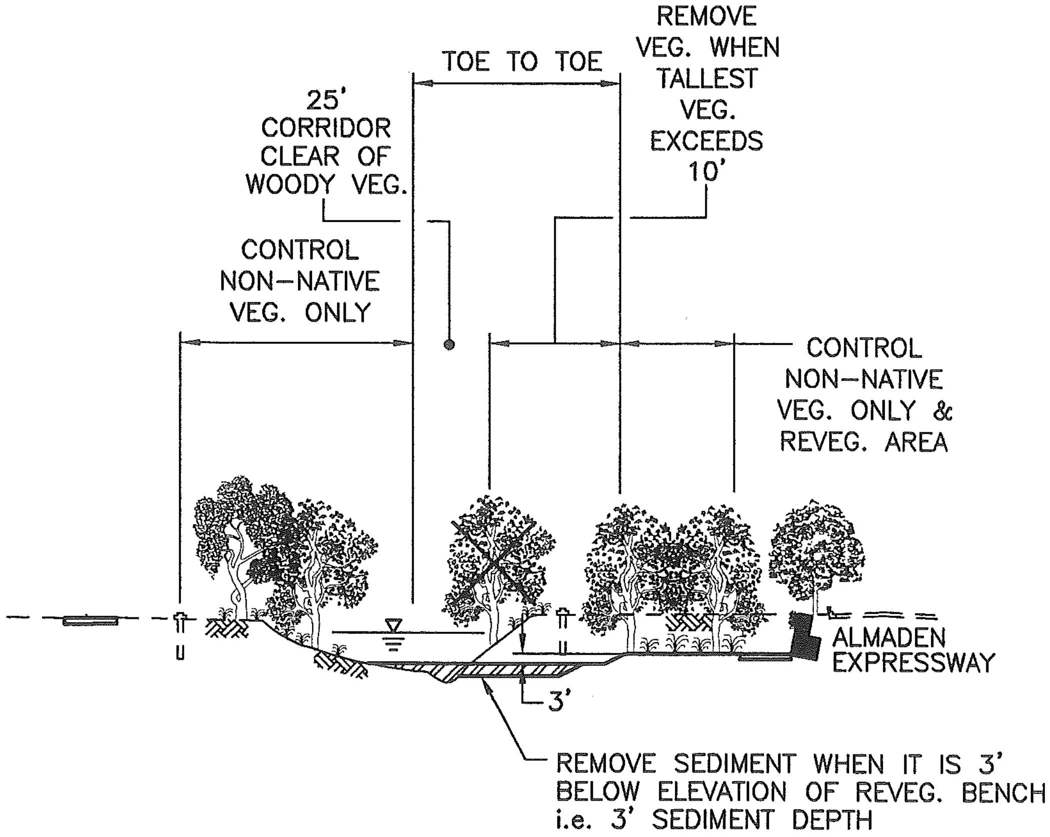

REMOVE VEG. WHEN TALLEST VEG. EXCEEDS 5'
REMOVE VEG. WHEN TALLEST VEG. EXCEEDS 10'
TOE TO TOE
25' CORRIDOR CLEAR OF WOODY VEG.
CONTROL NON-NATIVE VEG. ONLY
ALMADEN EXPRESSWAY
3'
FLOODWAY
REMOVE SEDIMENT WHEN IT'S 3' BELOW FLOODWAY BENCH i.e. 3' SEDIMENT DEPTH

TYPICAL SECTION
STA. 925+00± TO STA. 937+60±
NTS

FIGURE 3.75
MAINTENANCE PROGRAM (REACH 11)


REMOVE VEG. WHEN TALLEST VEG. EXCEEDS 10'
TOE TO TOE
25' CORRIDOR CLEAR OF WOODY VEG.
CONTROL NON-NATIVE VEG. ONLY
CONTROL NON-NATIVE VEG. ONLY & REVEG. AREA
ALMADEN EXPRESSWAY
3'
REMOVE SEDIMENT WHEN IT IS 3' BELOW ELEVATION OF REVEG. BENCH i.e. 3' SEDIMENT DEPTH

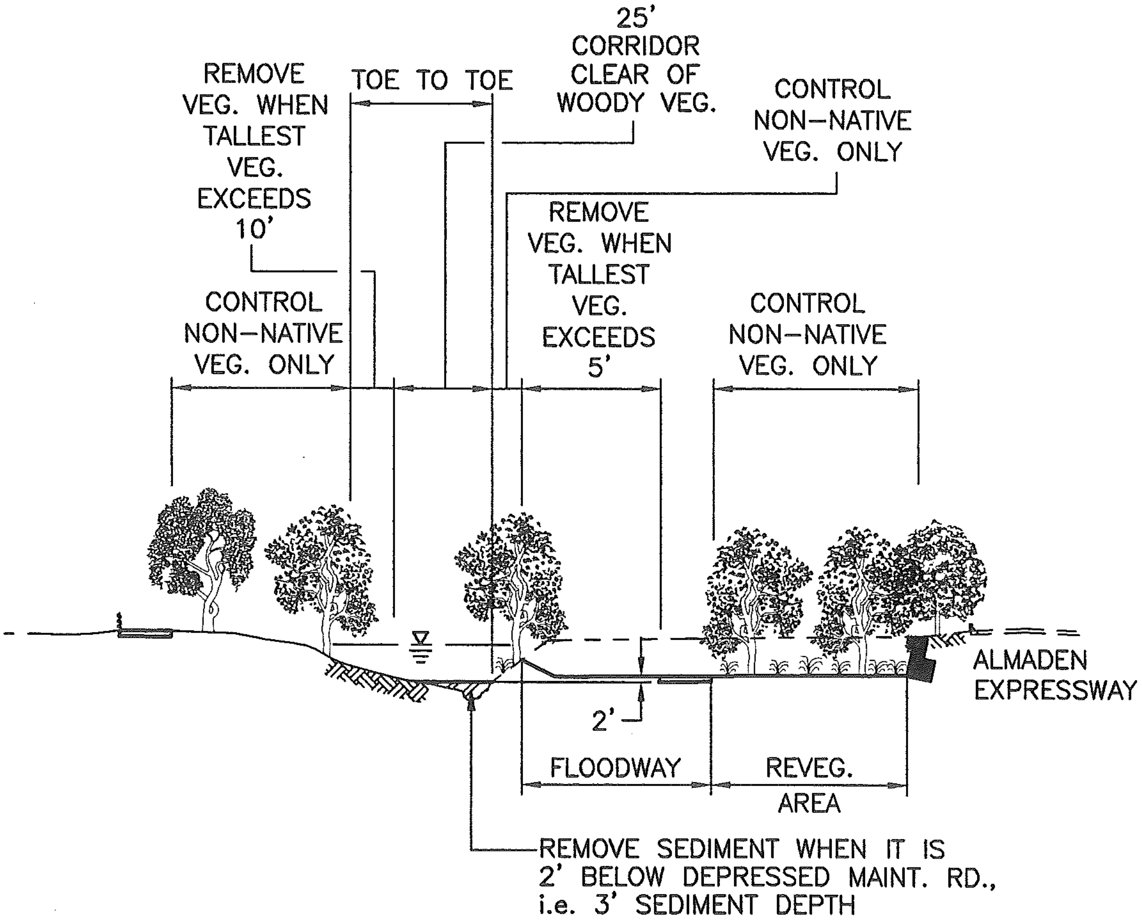
TYPICAL SECTION

STA. 942+00± TO STA. 948+00±

NTS

FIGURE 3.76
MAINTENANCE PROGRAM (REACH 11)

w:\dwgs\p\3015_104\maint\asize\m942-00.dwg

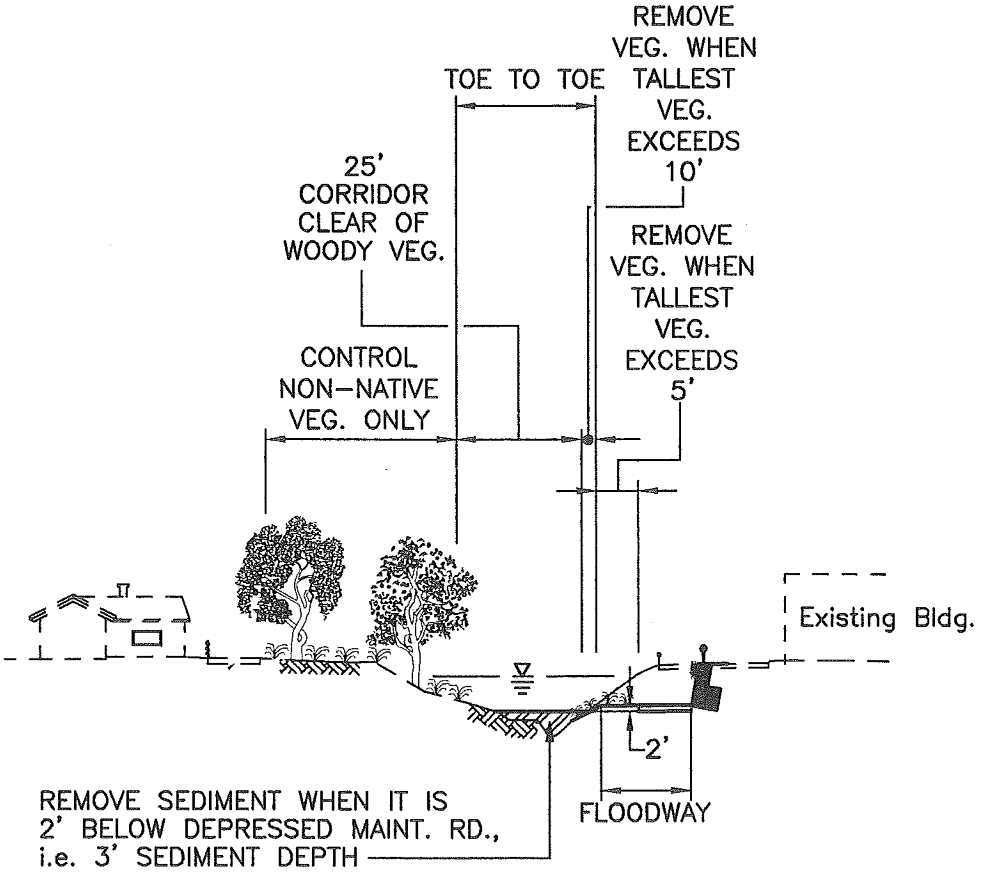

25' CORRIDOR CLEAR OF WOODY VEG.
REMOVE VEG. WHEN TALLEST VEG. EXCEEDS 10'
TOE TO TOE
CONTROL NON-NATIVE VEG. ONLY
CONTROL NON-NATIVE VEG. ONLY
REMOVE VEG. WHEN TALLEST VEG. EXCEEDS 5'
CONTROL NON-NATIVE VEG. ONLY
ALMADEN EXPRESSWAY
2'
FLOODWAY
REVEG. AREA
REMOVE SEDIMENT WHEN IT IS 2' BELOW DEPRESSED MAINT. RD., i.e. 3' SEDIMENT DEPTH

TYPICAL SECTION

STA. 949+60± TO STA. 951+10±

NTS

FIGURE 3.77
MAINTENANCE PROGRAM (REACH 11)

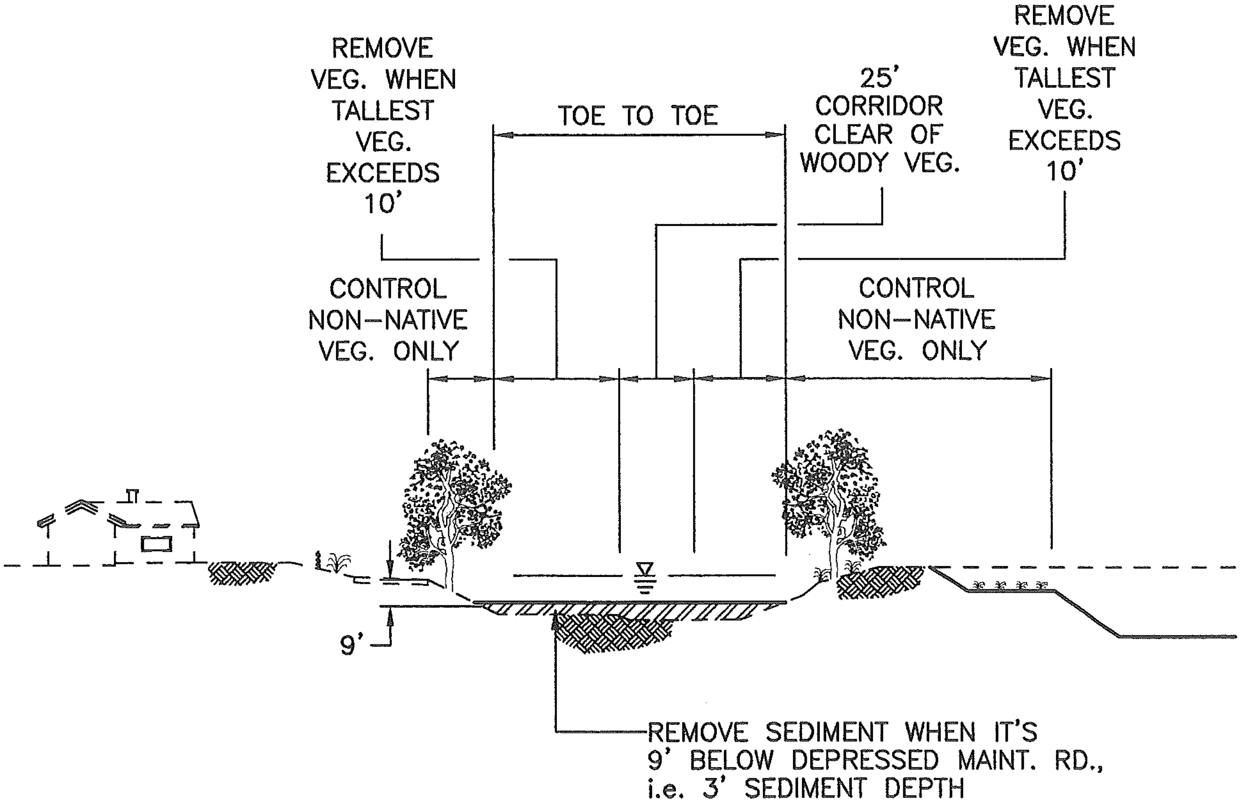

REMOVE VEG. WHEN TALLEST VEG. EXCEEDS 10'
TOE TO TOE
25' CORRIDOR CLEAR OF WOODY VEG.
REMOVE VEG. WHEN TALLEST VEG. EXCEEDS 5'
CONTROL NON–NATIVE VEG. ONLY
Existing Bldg.
2'
FLOODWAY
REMOVE SEDIMENT WHEN IT IS 2' BELOW DEPRESSED MAINT. RD., i.e. 3' SEDIMENT DEPTH

TYPICAL SECTION

STA. 952+80± TO STA. 954+00±

NTS

FIGURE 3.78
MAINTENANCE PROGRAM (REACH 11)

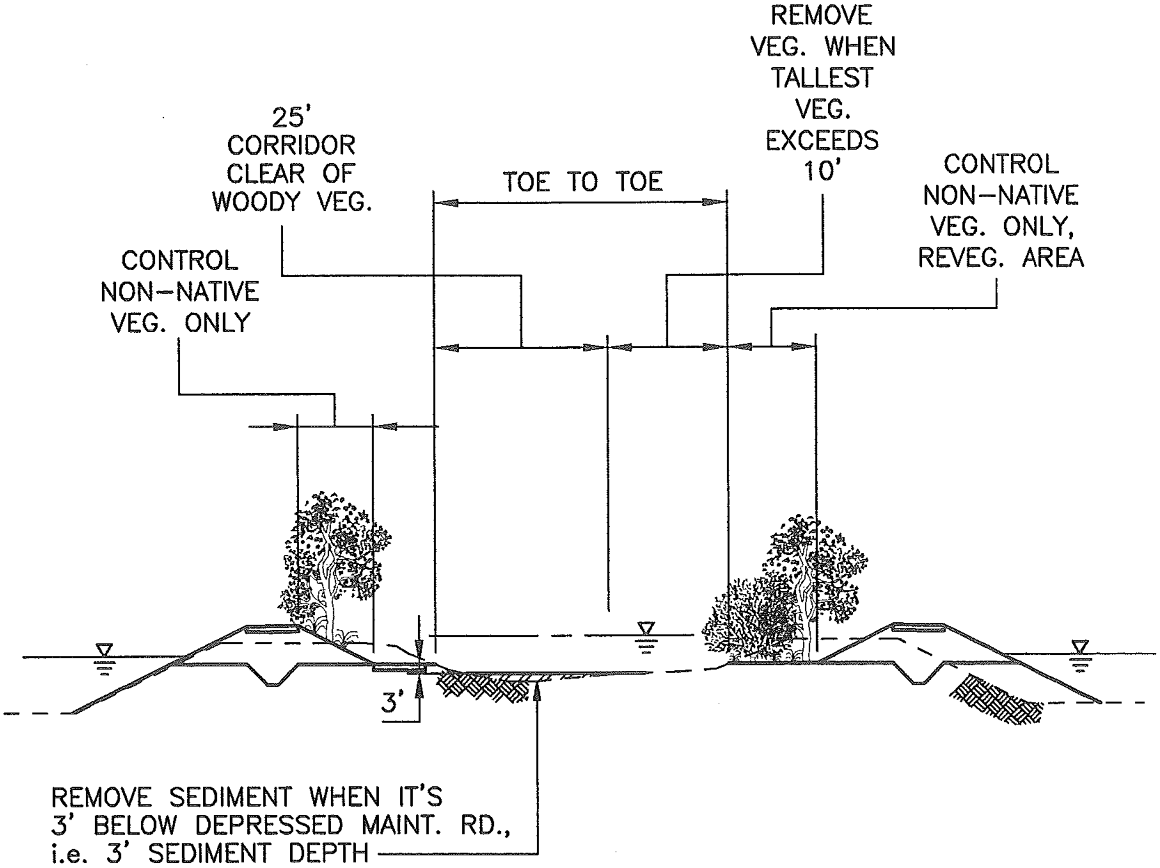

REMOVE VEG. WHEN TALLEST VEG. EXCEEDS 10'
TOE TO TOE
25' CORRIDOR CLEAR OF WOODY VEG.
REMOVE VEG. WHEN TALLEST VEG. EXCEEDS 10'
CONTROL NON-NATIVE VEG. ONLY
CONTROL NON-NATIVE VEG. ONLY
9'
REMOVE SEDIMENT WHEN IT'S 9' BELOW DEPRESSED MAINT. RD., i.e. 3' SEDIMENT DEPTH

TYPICAL SECTION

STA. 976+50± TO STA. 985+00±

NTS

FIGURE 3.79
MAINTENANCE PROGRAM (REACH 12)

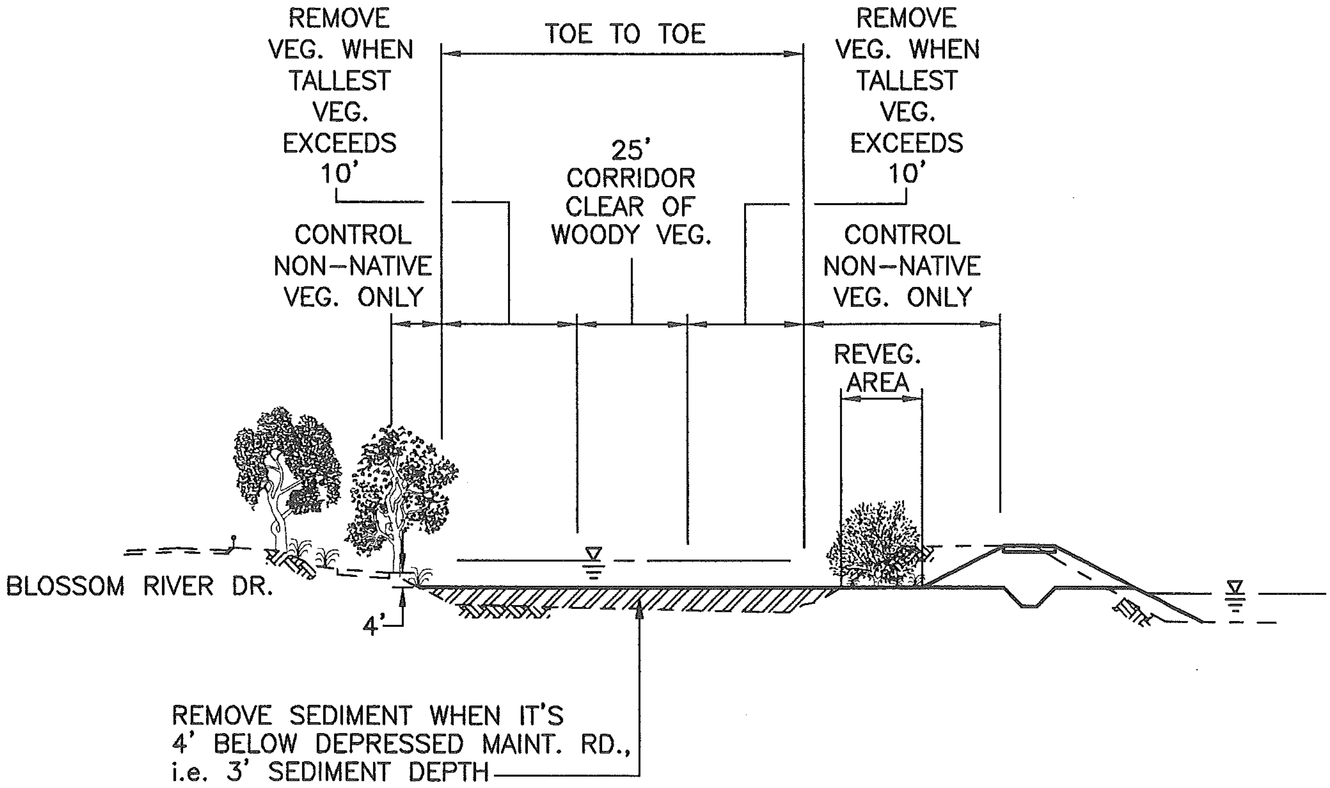

REMOVE VEG. WHEN TALLEST VEG. EXCEEDS 10'
25' CORRIDOR CLEAR OF WOODY VEG.
TOE TO TOE
CONTROL NON-NATIVE VEG. ONLY, REVEG. AREA
CONTROL NON-NATIVE VEG. ONLY
3'
REMOVE SEDIMENT WHEN IT'S 3' BELOW DEPRESSED MAINT. RD., i.e. 3' SEDIMENT DEPTH

TYPICAL SECTION

STA. 989+000± TO STA. 998+00±

NTS

FIGURE 3.80
MAINTENANCE PROGRAM (REACH 12)


REMOVE VEG. WHEN TALLEST VEG. EXCEEDS 10'
TOE TO TOE
REMOVE VEG. WHEN TALLEST VEG. EXCEEDS 10'
25' CORRIDOR CLEAR OF WOODY VEG.
CONTROL NON-NATIVE VEG. ONLY
CONTROL NON-NATIVE VEG. ONLY
REVEG. AREA
BLOSSOM RIVER DR.
4'
REMOVE SEDIMENT WHEN IT'S 4' BELOW DEPRESSED MAINT. RD., i.e. 3' SEDIMENT DEPTH

TYPICAL SECTION

STA. 999+00± TO STA. 1012+00±

NTS

FIGURE 3.81
MAINTENANCE PROGRAM (REACH 12)

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TABLE 3.22
Annual Maintenance Cost Estimate Summary for Preferred Project

Vegetation Removal	$85,000	
Sediment Removal	$15,000	
Trash and Debris Removal	$10,000	
Maintenance of Revegetation Sites	$125,000	(during establishment period—5 years)
Monitoring of Revegetation Sites	$25,000	

IMPACTS TO DISTRICT'S GROUNDWATER RECHARGE PROGRAM

Several elements of the preferred project would impact the District's groundwater recharge program. General soil disturbance from channel improvement and construction activities would reduce the natural recharge capacity of the Guadalupe River and Ross Creek. During construction, temporary disruptions to the recharge program may occur due to temporary dewatering activities.

Upstream of Capitol Expressway in the Guadalupe River and in Ross Creek, the proposed channel sideslopes would be lined with gabions and ACMs. These linings would preclude recharge along the channel banks. Preliminary results showed that 0.9 acre of sideslopes would be impacted from Capitol Expressway to Branham Lane in Guadalupe River and 1.6 acres in Ross Creek.

MITIGATION OF IMPACTS TO THE RECHARGE PROGRAM

The proposed channel widening upstream of Capitol Expressway in the Guadalupe River and in Ross Creek would increase recharge area in the channel bottom. Preliminary calculations showed that an additional 2.5 acres of bottom areas would be created from Capitol Expressway to Branham Lane in Guadalupe River and 1.6 acres in Ross Creek. As shown in Table 3.23, there would be a net gain of 1.6 acres in recharge.

TABLE 3.23
Impacts of Preferred Project on Recharge Areas

Creek Name	Recharge Areas	Pre-project Bottom Area	Pre-project Side Slope Area	Post-project Bottom Area	Post-project Side Slope Area	Overall Impact
Guadalupe River	U/S of Bryan Avenue	1.8 acres	0.3 acres	2.3 acres	0.1 acres	+0.3 acres
Guadalupe River	U/S of Capitol Avenue	2.4 acres	0.8 acres	3.8 acres	0.7 acres	+1.3 acres
Ross Creek	U/S of Almaden Expressway	0.5 acres	1.0 acres	1.6 acres	0.0 acres	+0.1 acres
Ross Creek	U/S of Cherry Avenue	0.2 acres	0.6 acres	0.7 acres	0.0 acres	-0.1 acres
					Net Change	+1.6 acres

IMPACTS TO LOCAL DRAINAGE

Water surface elevations during major storms would be lower with than without the preferred project. The decrease in water levels in the river would decrease the duration and frequency of flooding in the streets.

At Canoas Creek, floodwalls would be constructed along the north and south banks of the creeks. Since there are levees existing on both the north and south banks, the floodwalls would not incur additional impacts to the local drainage.

MITIGATION OF IMPACTS TO LOCAL DRAINAGE

To prevent reverse flow during major storms, flap gates would be installed at the storm drain outlets. Maintenance of these storm drain outlets and flap gates would be the responsibility of the owners of the storm drain systems.

COMMUNITY INVOLVEMENT

During the course of the study, District staff met with various homeowners, residents, businesses, and public agencies. Three public meetings were held in March 1989, where the project's background information and the flooding, erosion, and maintenance problems in the Guadalupe River were presented. Possible alternatives solutions along with the District's selected project solution were also discussed. The 260 people who attended those meetings were generally supportive of the flood control efforts.

Later in the year, District staff met with several smaller groups of residents to discuss concerns specific to their respective areas of the project. Each meeting has helped the staff revise the preferred project plan to incorporate community concerns. The concerns have included environmental impacts, adequacy of mitigation measures, increased noise, safety, and visual impacts.

In February 1990, District staff met with the Corps, the USFWS, and the State Department of Fish & Game. In response to concerns of the regulatory agencies, the EIR has addressed the project's impacts to the existing wildlife and vegetation and the proposed mitigation for those impacts. In addition, the EIR also contained an archaeological and historical impacts assessment, visual impacts assessment, traffic impacts assessment, and a relocation report for those properties directly impacted by the project.

A relocation meeting was held in April 1990 with all owners whose properties may be acquired by the project. At the meeting, the District's acquisition procedure and property owner's rights were explained. The meeting was attended by over 50 owners and tenants.

Three public map review sessions were held in December 1991 to present the revised preferred project. The public was able to review the engineering drawings and sketches, speak individually with the engineers and environmental staff, and offer concerns for improving the plan. Two concerns expressed were for park trails and the aesthetics of stepped gabions. Approximately 100 people attended the meetings. The reactions and impressions of the participants were largely positive.

In May 1995, three public meetings were held where the preferred project was presented. The 100 people who attended the meetings were generally supportive of the project and many would prefer to have a shorter construction schedule.

In January 1992, District staff made a presentation to representatives of several City of San Jose departments including Public Works, Planning, Airport, Traffic, Sanitary, Transportation, and Parks. All parties present were generally satisfied with the preferred project. The City Parks staff provided guidance from their Guadalupe River Park South Master Plan so that the project elements are complimentary, and their goal of one continuous trail becomes possible. The following are some of the general features that has been incorporated into the preferred project in response to the City's recommendations.

City of San Jose Transportation Department

The following City guidelines on vehicular and pedestrian circulation would be followed:

- Whenever bridges are closed and streets are realigned, traffic would be rerouted to parallel routes with minimal impacts to existing traffic circulation.
- Temporary closure of bridges or street would be performed only after traffic impacts, duration, time, safety, and community concerns have been thoroughly studied.
- Every effort would be made to maintain pedestrian access to public transit systems, parks, and schools.
- Emergency vehicles would be provided with at least two access points to a given neighborhood in the event of an emergency.
- At least 3 months advance notice to the City of San Jose Communications, and at least 72 hours notice to the Department of Streets and Traffic would be provided for all detours and closures.
- Due to the limited number of crossings along the Guadalupe River, no two adjacent bridges or streets would be closed to through traffic at any one time.
- The community would be kept informed of any and all closures, detours, construction noise, or other activities which may pose an inconvenience to the residents of the nearby areas. The District would develop a comprehensive community relations plan to pro-actively deal with these issues.
- Contractors would acquire approval from the City for hauling fill and excavation materials on City streets.

In specific reaches, the following requests were incorporated:

Reach 6

The District would maintain pedestrian access across Guadalupe River at all times to allow access to the Virginia Light Rail Station.

Reach 7

Closure of Willow Street would be performed only upon approval by the City.

Reach 8

The District would maintain pedestrian access to nearby schools and parks at all times.

The intersection of Mackey Avenue, Willow Glen Way, and Northern Avenue would be improved such that Northern Avenue ends at Mackey Avenue, and Mackey Avenue extends to Willow Glen Way to provide for safer vehicle and pedestrian access. The District and the City would cost-share on the bridge and street realignments.

Reach 9

Closure of Curtner Avenue would be performed only upon approval by the City.

Reach 10C

Hillsdale Avenue Bridge would be removed only after Pearl Avenue Bridge has been constructed. The District would enter an agreement with City and/or property owner to cost-share on the new bridge up to the amount which would have been required to replace Hillsdale Avenue Bridge.

Reach 12

The City plans to construct future Chynoweth Avenue which will affect approximately 1.4 acres of the existing percolation ponds. The City would place fill over the existing percolation ponds to accommodate a longer approach to the bridge and minimize the bridge span length across the river. The mitigation for lost recharge due to the City's impacts would be included in the District's proposed mitigation pond in this reach. The City would enter an agreement with the District to purchase land and perform work for which the City would later reimburse the District.

Canoas Creek

Closure of Nightingale Drive would be performed only upon approval by the City.

City of San Jose Design and Construction Department

The following City requests were incorporated:

Reach A

The contractor's operation northerly of Airport Boulevard would be regulated to minimize impacts to Airport Boulevard.

The proposed access roads that connect to Airport Boulevard will impact the existing landscaping and irrigation systems. Plans for replanting, relocation and protection the landscaping would be coordinated with the Airport Department.

Reach 6

The 8-inch sanitary sewer at Harliss Avenue and West Virginia Street would be relocated to avoid the new bridge abutment.

The existing 8-inch outfall on the east bank at the southerly side of West Virginia Street would be abandoned and the drainage taken into the 42-inch storm drain line existing at the northerly side. A new manhole and outfall would be constructed to clear the new bridge abutment.

Reach 7

The sanitary sewer siphon in Willow Street between Minnesota Avenue and Route 87 would be reconstructed.

Reach 8

The existing sanitary sewer siphon between Creek Drive and Mackey Avenue would be replaced by a new 8-inch gravity main parallel to the proposed box culvert connecting to the 10-inch main in Alma Avenue.

Reach 9

The existing twin 12-inch siphon at Curtner Avenue Bridge would be relocated.

Reach 11

The grade of the maintenance road upstream of Capitol Expressway would be revised to provide unobstructed functioning of the existing 42-inch outfall.

City of San Jose Parks and Recreation Department

The following City guidelines were incorporated:

- New bridge crossings would have a minimum vertical clearance of 12 feet above undercrossings to allow for continual access.
- Proposed access ramps would have a maximum grade of 5 percent to accommodate the disabled.

In specific reaches, the following requests were incorporated:

Reach A

The proposed maintenance road along the west bank would be located along the top of bank. Undercrossings with minimum 12-foot clearance would be provided under all bridges.

Reach 6

Any areas which consist of ¼ acre or more and are determined by the District as excess land would be available to the City for possible mini-park areas.

Reach 7

A 10-foot wide sidewalk would be provided on the south side of the new Willow Street Bridge and on the north side of the new Alma Street Bridge to accommodate heavy pedestrian traffic which would use these bridge crossings for trail access.

Reach 8

The existing sidewalks and street trees on Mackey Avenue would be preserved.

Reaches 9 and 10A

A continuous 8-foot wide sidewalk on the east side of Almaden Road and bicycle lanes on both sides of the street would be provided.

Reaches 10B and 10C

A 10-foot wide sidewalk would be provided on the south side of the bridge to accommodate heavy pedestrian traffic which would be associated with trail access.

Consistent with the District's creekside development policy, adequate space for a frontage road would be provided adjacent the new east top of bank.

San Jose Water Company

The following guidelines on the San Jose Water company facilities would be followed:

- Adequate space in new bridges and over new culverts for replacing water mains would be provided.
- All new water mains and wells would be installed by SJWC staff only.
- Project sites would be potholed to determine the locations of existing water mains. Potholing costs will be of District cost.
- When removing water mains from service, all necessary tie-ins and caps would be installed.
- All existing services would be transferred to the new mains.
- Current fire flow requirements set by the San Jose Fire Department would be maintained.

In specific reaches, the following requests were incorporated:

Reach 6

Before the water main at McLellan Avenue is disconnected, a 6-inch main on Grant Street from Palm Street to Vine Street, a 6-inch main on Palm Street from West Virginia Street to Grant Street, and a 6-inch main on Harliss Avenue from Willow Street to West Virginia Street would be installed. Two 6-inch tie-ins would also be installed for this reach.

Reach 7

An 8-inch bypass main would be installed at Alma Avenue to maintain service to the east side of the river before the 8-inch main at Willow Street is temporarily removed from service during bridge construction. The water main on the north end of Lelong Street would be permanently taken out-of-service. Adequate space for the 8-inch main in the new Willow Street Bridge and above the new culvert at Alma Avenue would be provided.

Reach 8

The 20-inch main at Willow Glen Way would be temporarily removed from service during bridge construction (the 8-inch main at Curtner Avenue would remain in service). The existing 6-inch main would be permanently capped and not replaced. Adequate space for the replacement of the 20-inch main in the new bridge would be provided.

Reach 9

The relocation of Well No. 5 at Willow Glen Way Station would include replacement of a tank, the existing well, booster pumps, station piping and electrical. The relocation site for the new well would be in close proximity to the existing well location.

The 8-inch main at Curtner Avenue would be temporarily removed from service during bridge construction except the 20-inch main at Willow Glen Way. The District would provide adequate space for the replacement of this 8-inch main in the new bridge. One 6-inch tie-in would be installed for this reach.

Reach 10

The 16-inch main near Wren Drive would be protected during the construction of the maintenance ramp.

Reach 11

Improvements to Bryan Avenue Station would include relocating an existing 17¼-inch main, lowering Well No. 4, eight ⅝-inch blowoff, and well appurtenances.

Canoas Creek

Adequate space between the existing 16-inch main under Nightingale Drive and the proposed additional 9- by 9.5-foot RCB, as well as, between the existing 16-inch main at Almaden Expressway and the proposed additional 20- by 12-foot RCB culvert would be provided. If these two mains are to be replaced, only one main would be out-of-service at any one time.

Ross Creek

The District would protect the existing 21-inch main that is located above the existing culvert when constructing the proposed additional 20- by 10-foot RCB culvert. A bypass main would be provided if the 21-inch main is to be taken out-of-service during culvert construction.

PROJECT COST, FINANCING, AND STAGING

The estimated total first cost of the preferred project is $120.4 million of which $45.7 million is right of way acquisition, $73.8 million is construction related, and $2.7 million is mitigation. An estimate of reach by reach costs are summarized in Table 3.24.

The preferred project would be funded by existing revenues generated in the Central Flood Control Zone. These sources include the District's allocation of the 1 percent property tax and flood control benefit assessments.

It is preferred that the construction starts in Reach 6 and progress upstream to provide maximum amount of flood protection as soon as possible without inducing flooding downstream. Vegetation installation in Reach 12 is proposed to start approximately in the same construction season as Reach 6 to provide immediate compensation for temporal loss of habitat due to the project. The estimated construction schedule is provided in Table 3.25. As shown in the table, the project construction could begin in Fiscal Year 1997-98. The schedule may vary depending on permit conditions, available funding and staging of construction elements. The schedule assumes continuation of benefit assessment revenues beyond the year 2000. Without these revenues the completion of all the proposed facilities could be delayed up to 20 years. Also, if another more costly alternative is constructed, for every $10 million increase in the proejct, there will be a 5-year delay in solving other flooding problems within the Central Zone. A 5-year delay exposes residents of the floodplain to 5 more years of the possibility of incurring flood damage.

TABLE 3.24
Guadalupe River—Summary of Preferred Capital Improvement Project

Reach	Limits	Proposed Measures	Total Cost (millions)
A	Bayshore to I-880	Levees, floodwalls, and maintenance roads	$1.3
6	I-280 to SPRR	Gabion bypass channel	$19.2
7	SPRR to UPRR	Gabion bypass channel	$26.6
8	UPRR to Willow Glen Way	Gabion bypass channel	$10.2
9	Willow Glen Way to Curtner Avenue	Selective widening and cribwall lining	$13.7
10	Curtner Avenue to Capitol Expressway	Bank widening, levee and widened gabion channel with revegetation	$15.3
11	Capitol Expressway to Branham Lane	Widened gabion channel	$7.8
12	Branham Lane to Blossom Hill Road	Levee and revegetation area	$17.8
Canoas Creek	Guadalupe River to Nightingale Drive	Floodwalls	$1.5
Ross Creek	Guadalupe River to Jarvis Avenue	Widened channel with articulated mat lining	$2.0
Guadalupe River, Alamitos Creek, and Guadalupe Creek		Fish Barrier Modifications	$0.3
		TOTAL	$120.4

TABLE 3.25
Guadalupe River I-101 to I-880—I-280 to Blossom Hill Road Capital Improvement Project Cost and Schedule Summary

Reach	Scheduled Construction[1]	Right of Way ($ M)	Mitigation ($ M)	Construction ($ Mi)	Total ($ M)
A	1998-1999	0.0	0.0	1.3	1.3
6	1998-1999	11.3	0.2	7.5	19.0
7	1999-2001	7.6	0.2	19.2	27.0
8	2002-2003	5.3	0.0	5.0	10.3
9	2008-2010	3.9	0.2	10.2	14.3
10	2010-2017[2]	3.8	1.2	10.9	15.9
11	2021-2023[2]	3.0	0.3	7.5	10.8
12	1998-1999	10.8	0.6	4.2	15.6
Canoas Creek	2022-2023	0.0	0.0	1.5	1.5
Ross Creek	2017-2018	0.0	0.0	2.0	2.0
Fish Barrier Modifications[2]	1997-2023	0.0	0.0	0.3	0.3
PROJECT TOTAL		45.7	2.7	72.0	120.4

[1] Assumptions: (1) no federal funding; (2) benefit assessment continues beyond year 2000.

[2] Including fish barrier removal. Interim fish barrier remediation will be provided.

CONCLUSIONS AND RECOMMENDATIONS

The existing flood carrying capacity of Guadalupe River between Highway 101 and Interstate 880 and between Interstate 280 and Blossom Hill Road is less than 1 percent design flow. This is the last portion of the Guadalupe River that lacks 1 percent flood capacity. A 1 percent flood in these reaches would affect over 7,000 existing structures resulting in estimated damages of $200 million.

The preferred project would provide protection to the community from the 1 percent flood and would accomplish most of the objectives of the District and community. The following are the beneficial impacts of the project:

- Flooding: Provides flood protection from 1 percent flood.
- Maintenance: Provides better access for maintenance and requires less intensive maintenance activity in the natural stream.
- Erosion: Repairs areas of active erosion, and protects banks from future erosion potential.
- Sedimentation: Requires less frequent sediment removal in the channel.
- Local drainage: Decreases the duration and frequency of flooding in the streets and local ponding.
- Water quality: Decreases sediment and turbidity in water contributed from erosion of banks. Identifies illicit connections to storm drain outfalls in support of nonpoint source program.
- Water supply: Increases groundwater recharge potential.
- Riparian vegetation: Mitigates impacts onsite and on adjacent lands and re-establishes a continuous riparian corridor along the stream with an additional 6,600 linear feet of overwater vegetation and 9 acres of riparian forest.
- Wetlands: Mitigates impacts onsite and on adjacent lands.
- Wildlife habitat: Mitigates impacts onsite and on adjacent lands and re-establishes a continuous habitat corridor along the stream with an additional 6,600 linear feet of overwater vegetation and 9 acres of riparian forest.
- Fish habitat: Mitigates impacts onsite and on adjacent lands, establishes a continuous riparian corridor, creates a continuous low-flow channel, removes all 8 fish barriers and provides fish access to 19 miles of stream habitat.
- Recreation: Complements the City's park and trail master plan and allows for 6 miles of future park and trail development that will connect Alamitos Creek to downtown San Jose.

Therefore, it is recommended that the preferred project be approved and plans be prepared for construction of the project.